BREAK-IN

May/June 2011

The Official Journal of the
New Zealand Association of Radio Transmitters (Inc.)

Dedicated to

Amateur Radio and Electronics

in New Zealand since 1928

In this issue:

- A homemade 4:1 balun
- Using 4nec2 antenna software
- Amateur interaction with the COMPASS-1 satellite
- Review; The *bhi*-NEDSP-1062 noise reduction unit
- Review of current resistor technology
- Knight's Point mini-VHF DXpedition
- ZL Crossword Number 12

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BREAK-IN

Volume **84**
Number **3**
May/June 2011

*The term **break-in** refers to a system in CW whereby the transmitting station can hear the other station's signal during "key up" periods.*

ISSN 0006–9523

OFFICIAL JOURNAL OF THE NEW ZEALAND ASSOCIATION OF RADIO TRANSMITTERS INC.

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Preferred electronic format is as Word.doc, *.rtf or *.txt files. Graphics and pictures should NOT be embedded in the text but supplied as separate *.jpg or *.tif files with a list of captions. Hard copy should be typed double-spaced.

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Typesetting and printing by ***Wyatt & Wilson Print Ltd,*** Christchurch, New Zealand.

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Annual Subscription:	$95.00
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Family Additional:	$30.00
Maximum Family:	$125.00
Overseas surface mail (No GST):	$95.00
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Concessionary and spread payment applications will be considered confidentially upon application to the Business Manager.

Break-In Single Copy	(member) $5.00
	(non-member) $7.50
Call Book	(member) $17.00
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All subscription and publication prices are GST inclusive.

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Indexes for past volumes of *Break-In* from 1949 to the present are available on the NZART website: <http://www.nzart.org.nz/breakin/index/index.html>

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From The Editor

John Walker ZL3IB
<editor@nzart.org.nz>

For the past few weeks members of Branch 56, Christchurch West Amateur Radio Club Inc, working in cooperation with Br05, Christchurch Amateur Radio Club Inc, have been very busy preparing and sorting items for a Used Equipment ("Junk") Sale held on Saturday 7 May. Over the past twenty plus years I have been actively involved in many such sales as Auctioneer and other roles and have noticed many changes.

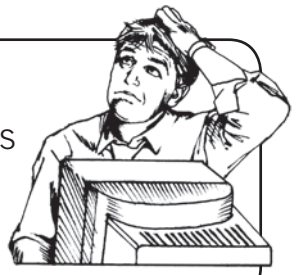
At our sale this year there was a large quantity of non-serviceable, older, solid-state gear and this was hard to sell. Perhaps this is not surprising since, unlike older valve gear, this sort of equipment can be hard to service and specialised spare parts expensive, difficult to obtain, or unobtainable. A more disappointing feature was that there was also little interest in a goodly range of new, unused components which seems to suggest that fewer hams are involved in building and experimenting. If true this is a sad state of affairs since in the past radio amateurs have been at the forefront of experimentation in practical radio and electronics.

Nevertheless *Break-In* still gets requests to publish articles on simple constructional projects. This we will do gladly if we receive suitable copy; but that is the limiting factor! We will also reprint suitable articles from other amateur radio magazines but this source is also limited.

I guess that's my lot for this issue.

73 *John Walker ZL3IB, Editor*

Next deadline for copy is
10 July 2011



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From The President

Roy Symon ZL2KH
<zl2kh@xtra.co.nz>

The results of the election are out and I thank those who put their trust in me by voting for me. I will continue to do my best for you all. Approximately 40% of members exercised their democratic right to choose who their representatives would be for the next two years, so they have the right to criticise the council they have chosen. Non members and the 60% of members who did not vote have forfeited their right to be critical. I don't want to hear any moans and gripes from them.

I am confident that council will have a successful two years if all councillors work together as a team, put any personal egos aside, and make all decisions for the good of amateur radio. I will be disappointed if there are personal attacks, threats of legal action by councillors against other councillors, or behaviour more suited to a kindergarten than a group of mature adults.

I am delighted to be able to report to you all that the vacancy for a ZL4 councillor has been filled. Terry Thomas ZL4TAE volunteered, and the incoming council were unanimous that he be appointed. Terry will assume his position, along with the other councillors-elect after the AGM at Silverstream.

Roy Symon, ZL2KH
President, NZART (Inc).

Situations Vacant

NZART Council is calling for expressions of interest for the following Officer .Vacancies. Applicants must be members of NZART.

1. Publicity and Marketing Officer

Applicants for this role can be located anywhere in New Zealand. The ideal person for this role would have experience in dealing within areas of publicity and marketing.

A job description is available at <http://www.nzart.org.nz/nz/jd/jd-marketing.pdf> or from NZART HQ.

The Publicity Officer reports to NZART Council through the Officer Liaison Councillor.

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All positions are voluntary, however operating expenses will be refunded as per the NZART policy on Officer's expenses.

Applications for these positions will be accepted from interested persons by writing with supporting documentation to the General Secretary, NZART, PO Box 40 525, Upper Hutt 5140.

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T Short	Auckland	29	ZL1ATS
J M Davidson	Picton	22	ZL2LMH
G Rusbatch	Auckland	2	ZL1GRA
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Oliver Jenks	Kirwee, Christchurch	5	ZL3ODJ

Break-In 50 Years Ago

Craig Crawford ZL3TLB

May 1961
VHF News by Bill Hamer ZL2CD

Amateur signals from space?

Amateurs in ZL, no less than others overseas, have taken intense interest in the space research programme. They have done much valuable work in visual and radio observations of the various vehicles which have been launched. Recently Project Echo gave many amateurs the opportunity to bounce VHF signals back from the sky. Overseas several such "satellite bounce" contacts have been made.

Now comes news of a project to fire the imagination and enthusiasm of amateurs to a greater pitch of "Sputnik Fever". It is "Project Oscar". In the American pattern the title stands for "Orbital Satellite Carrying Amateur Radio". Dreamed up by Don Stoner W6TNS and taken up by an enthusiastic committee of West Coast amateurs, including many professionals in the satellite field, Project Oscar may reach reality this year.

Briefly Oscar will be a series of commercial satellites packed with amateur VHF gear. They will be sent aloft "piggyback style" in conjunction with other planned US satellites. OSCAR 1 will contain a 20 milliwatt transmitter operating on 144 megacycles. Its purpose will be to provide valuable propagation data on the amateur two metre band.

OSCAR2 is somewhat more ambitious. It is intended as an active VHF relay station with a receiver on 52 megacycles and a low powered transmitter on 144 megacycles. A command system will be used to turn the satellite equipment on and off. The satellite will be available for the use of amateurs worldwide. It is expected to be able to service a ground area of approximately 2000 square miles in diameter, so that ZL to VK contacts on VHF could become commonplace.

A Homemade 4:1 Balun; inexpensive and, surprisingly, effective.

by Ian Boot, ZI1TXZ. email <iboot@slingshot .co.nz>

This article first appeared in the RARC (Rotorua Amateur Radio Club, Branch 33) March 2011 Newsletter and the preamble has been slightly altered by the author for publication here in Break-In.
The article by George Badger W6TC published in the April 2010 QST *Magazine, pages 33-36, served as the inspiration and basis for this Balun article. I have also included his explanatory coil winding diagram towards the end of this article.*

At my QTH in Ngongotaha, Rotorua, I have recently installed a new non-resonant, HF, 41m (134'10") long wire dipole, at 10m (33'0"). This was deliberately made a little longer than an 80m resonant dipole, which would have been about 40m long . Due to property restraints, this antenna is not ideally orientated, one leg points north and the other leg points a little south of east. It is designed to use with a tuner (mine is automatic) with the goal of being able to tune all HF bands, from 1.8 MHz to 29.5 MHz. Initially I made, and installed, a 1:1 coaxial choke, (see, Figure 1) located outside the shack, fastened to a wooden beam, with about 3m of 50 ohm coax to the tuner. On the antenna side of the choke, I connected the 300 ohm twin ribbon feeder, spaced away from the aluminium mast and up to the centre fed dipole legs.

The setup described performed quite well, but the performance dropped away at 1.8 MHz and the tuner struggled to tune it. Also, the SWR figures obtained on the antenna side of the tuner (tuner disconnected) with an antenna analyser were higher than I wanted to see. The highest SWR figures were greater then 31:1 at 1.85 MHz, although they were tunable.

I decided to make and try a 4:1 balun and in fact I made and tested four different ones, using winding data from articles in published Ham literature. Of course, being in the mindset of "Use what you have available" I struggled. Each was wound on different, unknown types of toroid cores. I even tried to use a magnet to choose, reasoning that an iron powder type should be more magnetically attractive and stand out from a ferrite one. These were all Guanella (current) type designs. All worked with varying efficiencies but I still had major variations between bands, none of them worked properly on the low band and were prone to heating, probably due to my inappropriate choice of core materials.

Whilst doing these experiments, I saw an article in the April 2010 issue of *QST*, describing how to make four different types of 4:1 current baluns, all air-cored. I decided to make and try one of these in place of the coaxial cable choke balun shown in the picture. My wire sizes and turns ratio are slightly different from the original article.

The subject of this article, concerns the making of this new balun. I have in fact now made two identical baluns, one without terminals, which is now installed permanently, as shown Figures 2 and 3. It has more than fulfilled my hopes and expectations, returning lower SWR ratios for the tuner to work with. The highest SWR figures obtained now, sweeping the HF bands with the antenna analyser without the tuner, is 9.8:1 and that is at 3.9 MHz. Thus I now have easier tuning and unexpectedly, reduced noise levels, with good signal reports!

I must admit, that this type of balun is not as "pretty" looking as the coaxial choke it has replaced. The coax 1:1 choke is often referred to in Ham Literature as the "ugly Balun", however, as the comparison pictures show, I think my new balun deserves to be given that name! But, in this situation I can suffer it's ugly looks for the increased performance it gives.

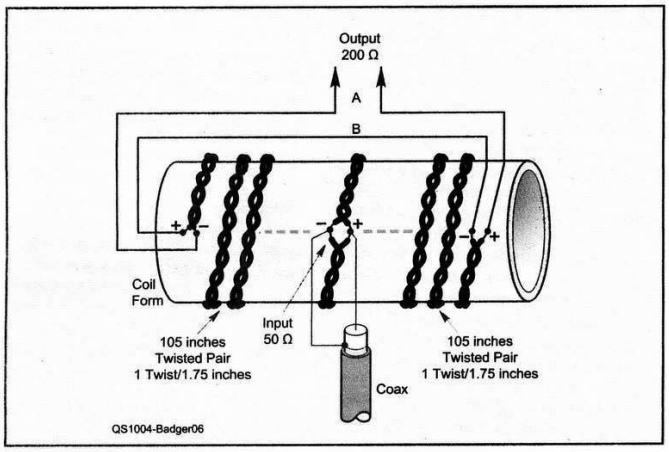


Figure 6 — Schematic diagram of the two twisted wire baluns shown in Figure 1. For clarity, only a few turns of twisted pair are shown on each side of the coax 50 Ω input connections. The 50 Ω connections are made through two holes at the center so that the coax can be fed into the balun from the left end. Leads A and B are placed inside the balun bringing the 200 Ω connections out to the right. The pairs are held in place on each end with tie wraps and by running the wire through adjacent holes in the plastic.

The original descriptive illustration from the article in QST magazine. This shows the windings and interconnections required.

The second balun, described in detail, has terminals but is otherwise identical to the one now installed at my QTH, which is directly connected, without terminals. The following description should enable any ham to replicate it with the expectation that it will perform.

Refer to Figure 4 which shows the basic components required and comprises:

- 1 off; 200mm of PVC rainwater downpipe, 82mm OD but dia. not critical.
- 2 off; 3.200m lengths of house wiring TPS cable. Type 14870 or 14850 which has 3 cores, each with 1mm dia. solid copper wires, 2.25mm OD over the insulation. (If other cable sizes are used, tests will be required

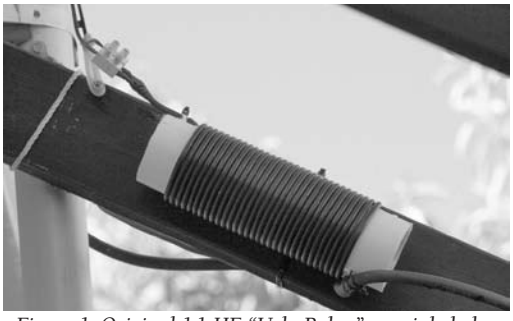


Figure 1. Original 1:1 HF "Ugly Balun" coaxial choke.

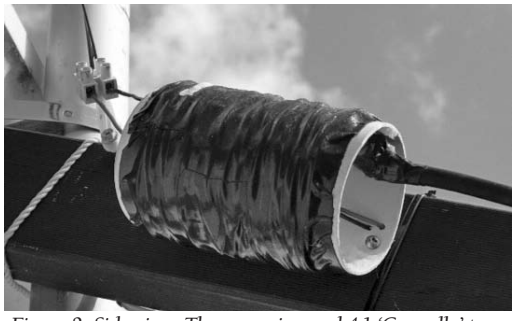


Figure 2. Side view. The new, air cored 4:1 'Guanella' type current Balun. Installed and weatherproofed with self-amalgamating tape and with silicone sealant to coax joints.

Figure 3. End view, new 4:1 Guanella Balun.

Figure 4. The components required to build the Balun.

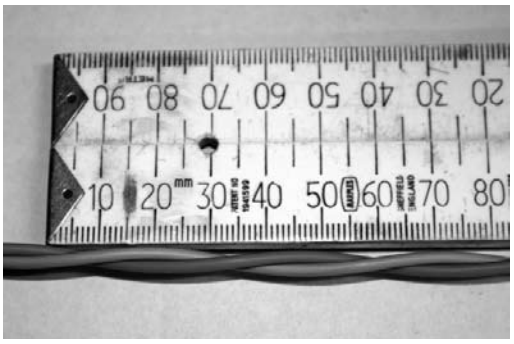


Figure 5. Cables twisted together at 1 complete twist per 50mm.

Figure 6. Coax, socket and centre of winding connections.

to determine the twists required to achieve 100 ohms impedance over the max. and min. frequencies the balun is required for; see details below).

- 1 off, 50 ohm coax socket and short length of 50 ohm coax (say 100mm long).
- 2 off, binding posts. These will connect to the balanced feedline.

Strip off the TPS cable outer coverings and keep a pair of the same coloured wires from each length. If the lengths become sharply bent or crinkled they may be straightened easily by clamping one end in a vice or similar and the other end pulled hard with a pair of pliers, you will feel the wire give slightly, at which point the wire becomes straight and is slightly stiffened, making the twisting operation easier. Take a pair of different colours and approx. 200mm from one end of the pair, tape them together. Measure 2.8m and tape each pair together again at this point. The more difficult exercise now, is to twist together each pair at the rate of a full 360 deg. twist every 50mm, between the taped points (Figure 5). At the end of the twisting exercise, the now twisted section will be shorter. Secure one end of each pair and yank the other end with pliers; this will slightly lengthen the section and set the twists. If care is taken at this stage, the impedance for each 2.8m twisted length will be 100 ohms. At this stage do not remove the excess untwisted cable at each end, which will be used for the final winding interconnections.

As a matter of interest and especially if you contemplate using different cable to what I used, the following method (taken from the MFJ-269 operating instructions; section 7.3, pp 45-46) was used to determine the impedance of what is in effect, a pair of transmission lines. Solder a carbon (non-inductive) 100 ohm resistor across the far end of each pair of twisted wires. The other end of each pair (one pair at a time) is connected to an MFJ Antenna Analyser (isolated and on battery power). Set the analyser to the lowest frequency at which you propose to operate, in my case this was 1.85 MHz, and read the on screen resistance figure, in my case this was 96 ohms. Then set the analyser to the highest frequency you will operate at, in my case 29.5 MHz and this gave a resistance figure of 104 ohms. Multiply both resistance figures together, ie 96 x 104=9984, taking the square root of 9984 gives the cable impedance of 99.92 ohms which is close enough to 100 ohms.

It is appreciated that not every reader/constructor will be fortunate enough to have access to an antenna analyser, but having now made two of these baluns and tested each, the above impedance checks should be unnecessary provided the same cable is used.

The next step is to fasten the 50 ohm coax connector into one end of the PVC tube and to drill two holes on the tubing centre line, bringing up the pre-tinned coax centre and braid stubs. Mark them + and – with a pencil. See Figure 6.

Now the coil winding can commence. The first twisted pair is wound on clockwise, 9 to 10 turns. Turn numbers are not critical, but the full 2.8m twisted section must be wound on, soldered to centre coax tips, coiled, then secured temporarily with insulating tape. See Figure 7.

Followed by the second half of the coil, wound in an anti-clockwise direction. See Figure 8.

Finally, the two pairs of free coil ends are connected up to form the balun. Looking at Figure 8, the right-hand green wire (-) must be connected to the left-hand red wire (+) internally, drill appropriate holes in the PVC tube to enable this. The r/h red wire and the l/h green wire are then connected to one each of the binding posts for future connection to each leg of the balanced feeder and ultimately to each leg of the wire dipole. The final pictures, Figures 9, 10, 11 show the completed balun and diagrams. Total costs will vary according to your junkbox but with luck, it will cost very little. As in my own installation, one can even dispense with the terminal fittings!

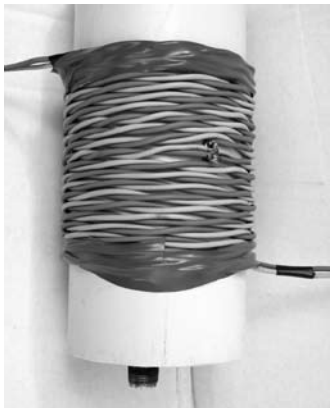


Figure 8. Second half added and temporarily secured.

Figure 9. The completed 4:1 Guanella current Balun.

This balun does not have a powdered iron or ferrite core and therefore does not suffer from saturation, heating or non linear effects. βi

Ian ZL1TXZ

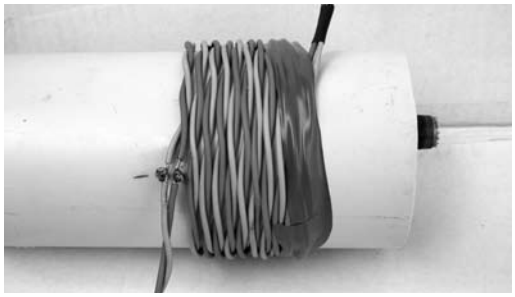


Figure 7. First half coiled and temporarily secured.

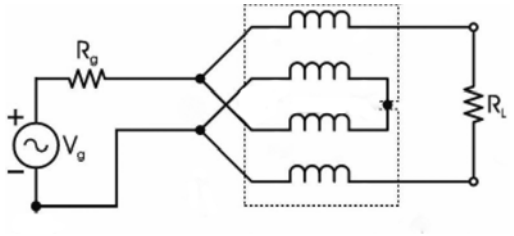


Figure 10. Schematic of a typical Guanella type 4:1 current Balun.

Using 4nec2 Antenna Software; A Tutorial. *Part 1 of 2*

by David Conn VE3KL

(Reprinted from The Canadian Amateur *Mar/Apr 2010)*

(Note: This article uses TCA HotLinks to provide access to enriched media from the RAC website. For more information, please go to <www.rac.ca/tca> *Mar/Apr 2010)*

Background

System simulators are now used extensively in all fields of science and engineering. At first there was a great reluctance to use these tools for many reasons including the lack of accurate models and the fact that the software was extremely difficult to use: only dedicated experts could get results. However, with the explosion of integrated circuit technology, it is now impossible to do complete hand calculations simply because of the large size of the devices. An integrated circuit with a few million gates requires extensive use of Computer Aided Design tools (CAD).

The same thing has happened in many other fields such as: mechanics, robotics, neural sciences, geological sciences and electromagnetism. Hence, these tools became more and more available at extremely low cost. Radio amateurs around the world use simulators for the following reasons:

- To assist in the design of antennas.
- To review commercial antennas in order to see if the antenna of interest is appropriate for their use.
- To learn more about antennas. This is a valid exercise by itself. You can answer many questions that have been in the back of your mind. For example: what is the best height for your antenna for DX operation or to set the impedance to 50 Ohms?

There are several antenna simulators that are available to Amateur radio operators that are easy to use and some are even free. I have found that the biggest problem for beginners in the field of simulation is *getting started*.

This article shows you how to get started by studying very simple antennas that you already understand such as the half wave dipole mounted above ground. Important screen shots are included on my website for your assistance, see TCA Hotlink, 1.

The antenna simulator that is used here is 4nec2 by Arie Voors. It is full-featured, free and quite easy to use. To use this or any simulator, it is necessary to understand the basic principles of antennas: gain, impedance. It is also necessary to know a little about the method of calculation used by the simulators: the elements of the calculation method are described in this article (no math used). You will find that your knowledge of antennas will be greatly enhanced by using these simulators simply by studying the brilliant graphics packages that are included. You can visually see what happens when a dipole height is changed or when its length is shortened. 4nec2 uses a basic algorithm called NEC2 which was written by Jerry Burke and A. Poggio at Lawrence Livermore Labs in 1981, under contract to the US navy. NEC2, (TCA Hotlink, 3) was later released to the public and is now available on most computing platforms. Although NEC2 can be used as a stand alone program, several people have developed a driver for it that makes it easy to use and adds many useful operating functions as you will see in this article.

The basic idea is that the antennas, collections of wires, are divided into many small segments that can be individually analysed by applying simple formulas. Then the complete antenna is analysed by adding the contribution of all these segments with an old technique know as the Method of Moments. All we have to know is that each antenna wire is divided into small segments that are connected together. How many segments are used? The number of segments is usually set to 20 per wavelength as a minimum but this is not critical. In our simple example given in this article, we will use 31 segments for a half wave dipole. The Method of Moments allows us to place voltage sources (the transmitter) and loads such as traps into a single segment. That's all you have to know about the calculating engine.

4nec2 Software Overview

4nec2 has the following main features:

- Full featured Windows based program: freeware.
- Calculates antenna patterns. We will use 2D plots in this tutorial.
- Calculates near field. We will not use this feature.
- Graphical display of circular/linear polarisation. We will use the total field in our example.
- Calculates and displays complex impedance in several formats including the Smith Chart.
- Extensive graphics built into the package. This is one of its most important features.
- Several file editors ranging from a simple to use graphical editor to an advanced (but easy to use) menu driven editor. A simple notepad editor can also be used. This is useful for modelling extremely complex antennas that are very difficult to set up manually.
- An easy to use antenna optimiser built into the package. This is the big gun of the program which is not used in most other packages. This feature allows us to tune the antenna to meet some requirement. For example, you can guess at the required length of a dipole and ask 4nec2 to adjust its length to find the best SWR at some frequency. This is especially useful for antennas like a three element Yagi which is extremely difficult to "tweak" by hand. You can ask 4nec2 to find the best element lengths and spacing to maximise the gain or front to back ratio or SWR. I used this feature to design a 2 element 20 metre beam to set the impedance to 50 Ohms. The trade off here is that the gain is slightly lower than the maximum value but the impedance is 50 Ohms so that a matching structure is not needed.
- Geometry builder: this utility allows users to build commonly used antennas like parabolic dishes, patch antennas and many other structures.
- Includes a handy antenna matching utility.

Let's get started

Since 4nec2 contains a vast number of powerful features, it is not possible in a short tutorial to cover them all. In fact it is not even desirable to do such a thing. We will keep it simple so you can become comfortable with the package using its most important features. You will be surprised how fast you can proceed if you get the basics sorted out.

The antenna that we will study is a simple 10 metre horizontal dipole that is mounted either in free space or over a real ground. It is paramount that we define the orientation of the antenna with respect to north/south, east/west and the location of the antenna. Let's place the dipole along the east/west direction: the x direction for the simulation. This means that we expect the antenna to radiate most of its power in the north/south direction (broadside to the antenna), the y direction. Also, let's place the centre of the antenna in the middle of your backyard at a height of 5 metres. In terms of the coordinate system used in 4nec2 this means that the antenna centre is located at $x = 0$, $y = 0$ and $z = 5$. The z axis is always the vertical (height) coordinate.

Step 1: Download and install 4nec2

Download the latest 4nec2 default version of the software from the 4nec2 home page, (TCA Hotlink, 2).

Follow the instructions using the install wizard. Normally, the wizard installs the software in the C: drive of your computer. I use

this default since I can readily find the program and its utilities when needed. The wizard asks if you want to have a desktop icon: check the box as you will need it. Also don't create a start menu folder. It might be of use later but not now.

Once this is done exit the program and close all windows since you will need to put the 4nec2 help file on your desktop for later use. To do this look in the 4nec2 folder on your C: drive and find the sub folder exe. There you will find the 4nec2.hlp help file. Right click on it and drag it to your desk top and copy it there. In the new versions of 4nec2, there is also an HTML version of the help file, 4nec.chm.

Step 2: Open 4nec2 and set up the preferences

Now, open the 4nec2 program. The Main window should appear on your screen. This is the window from which you perform all of the operations. The first time you run the program, a very simple sample file will appear. We will change that file and save it into a folder of your choice. I use a folder called 4nec2files in MyDocuments.

The first thing to do is set the program settings to fit our needs. Click on *Settings* in the *Main* window. If other windows appear, close them all except the *Main* window. Then:

- Check NEC Editor (new): this is the editor that we will use to define the antenna. The *Settings* window will close and must be re-opened.
- Now, make sure that everything else in the settings list is unchecked.
- Click on Input Power and set it to 100.
- Click on Char-impedance and set it to 50.
- Click on Phi/Azim and select Azim/Elev.
- Click on Length unit and set it to Meters.
- Click on Radius unit and set it to Millimeters: this is the radius of the antenna wire.
- Click on NEC-Engine and set it to Nec2dXS*.ece if you are using Windows XP, otherwise use Nec2d.exe for other windows operating systems.

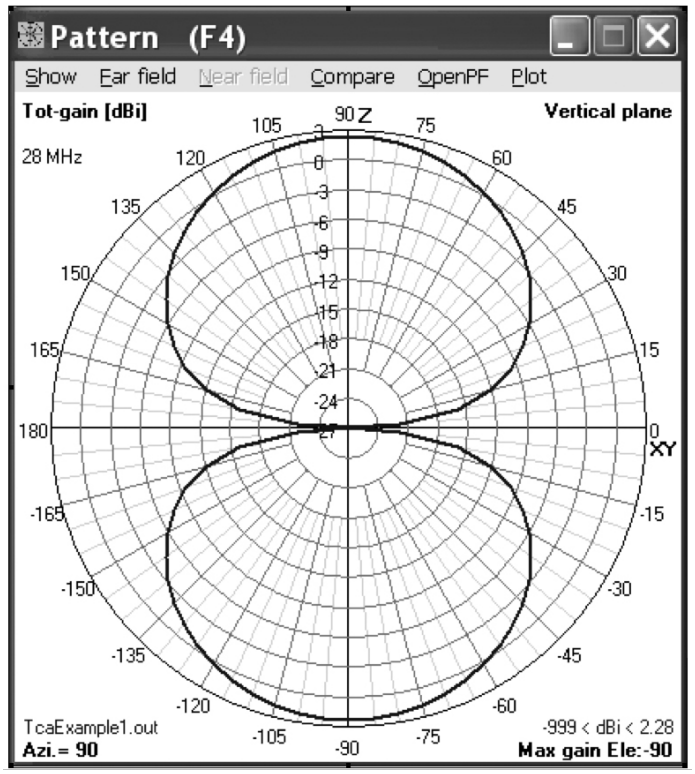


Figure 1. This figure shows the far field antenna pattern in the vertical plane for a simple dipole antenna that is mounted in free space. The Azimuth angle as shown is 90 degrees indicating that the pattern is taken along the X axis. The antenna is aligned on the X axis so there is no radiation for zero or 180 degrees.

Your settings are now set up. Check again to see that only one item, NEC Editor(new) is checked and that the other settings are correct.

Step 3: Insert the Antenna Dimensions, Signal Source, Frequency and Ground Type into the editor

At this time, we are going to insert the data manually. This is very easy for moderately sized antennas like a four element Yagi. In our case, it is even easier since we have a simple half-wave dipole.

Antenna dimensions

Click on the *Edit* tab in the *Main* window and select *Input(.nec) file*. The *Edit* window now appears. Click on the *Geometry* tab. Set the Geometry boxes as follows:

- Nr = 1 There is only one wire.
- type: set the element type to wire by using the drop down list. The default is usually set to wire.
- Tag refers to wire number: set to 1.
- Segs refers to the number of segments in the wire: set to 31.
- Let X1= -3, Y1= 0, Z1 = 5, X2 = 3, Y2 = 0, Z2 = 5 and Radius = 1mm.

It is a good idea to check your input data now as everything depends on this first step. Go to the *Main* window and click on the *Window* tab and select *Geometry*. You should now see a picture of your antenna. It should contain one wire mounted 5 metres above ground. You can see the antenna from different positions in the *Geometry* window by left clicking/holding and dragging the mouse.

If all is OK save your file now and several times as you proceed. Use the *File* tab in the *Edit* window to do this.

Adding a signal source

We will now add the signal source (transmitter) to the model. To do this use the *Source/Load* tab in the *Editor*. Set the Source boxes as follows:

- Check *Show source*.
- Nr =1: set by the program at this stage.
- Type: select *Voltage-src* from the drop down list.
- Tag = 1: this refers to wire number 1.
- Seg = 16 : We place the voltage source at the center of the antenna.
- {opt} = 0: not used here.
- Real = 100: real part of voltage set to 100 Volts.
- Imag = 0: imaginary part of the voltage.
- Mag/Phase will bet set by the program.
- {norm} not used here.
- Comment: Voltage Source.

Adding the frequency and ground type

Now, set the frequency and ground type by using the *Frequency/Ground* Tab in the *Editor*. Set the Frequency to 28 MHz and select *Free-space* as the ground type. Later we can use the Real Ground type. After all, your back yard is not located in free space. Save the edit file.

View your complete antenna in the *Geometry* window as before. You should now see the antenna with a source located at its center and a ground. Check to see that the source is in the centre of the antenna.

Step 4: Run the program … this is the fun part

Now, go to the Main window of 4nec2 and click the *Calculate* tab. Select *Nec output-data*. Select *Far Field pattern* in the pop-up window and click the *Generate* tab. You will now see the *Pattern* window. This is shown in Figure 1 and on my website screen shots.

This window contains a lot of information and is well worth studying. The important items to notice are:

- The plot is for the vertical plane as shown in the upper right portion of the window. If your window comes up as the Horizontal plane, change it to the vertical plane by using the *Far field* tab in the *Pattern* window and un-check *Horizontal plane*.
- This is a polar plot of the radiation pattern. Notice that the outer scale is 2.28 dBi as expected for a half wave dipole mounted in free space and the *Pattern* is labelled as *Vertical plane*.
- The Azimuth angle is shown in the bottom left corner of the window. It is usually set to a default of 90 degrees. Your window might be different. To

continued on page 8

continued from page 7

change the Azimuth angle for the view use left/right arrow keys on your computer. Make sure it is set to 90 degrees. An Azimuth angle of 90 degrees indicates that the antenna is viewed at 90 degrees to the Y axis: along the X axis. You can check this in the *Geometry* window by setting the Azimuth angle to 90 degrees using the mouse or with the right/left arrow keys.

Now that you have observed the far field plot for the antenna mounted in free space, let's make one very simple change to the file and add a perfect ground:

- Go to the *Main* window and click *Edit*
- Then click on the *Input(.nec)* file as before.
- Click on the *Frequency/Ground* tab and select *Perfect gnd* in the menu under environment type.
- Then calculate and display the far field as before. Set the Azimuth angle to zero or 180 degrees in the *Pattern* window using the left/right arrow keys. This means that we are looking at the broadside view of the antenna pattern.

Notice that the take-off angle is 30 degrees and that the maximum gain is equal to 8.07 dBi. This might seem to be high. Two things make the gain high: we have assumed that the ground is perfect and that the antenna is longer than one half wavelength. That is, big antennas have high gain. Notice that there is no radiation below ground since we have assumed that the ground is a perfectly conducting sheet of metal.

Finally, we will look at the frequency response of the antenna to see what the SWR and input impedance look like. Make sure that your Edit file has been saved. To generate the frequency response:

- Go to the *Main* window functions as before using the *Calculate* tab. Select *NEC output-data*.
- Select *Frequency sweep*. Set the *Start* frequency to 20, the *Stop* frequency to 40 and the *Step* frequency to 1. All frequencies are in MHz.
- Click *Generate* to launch the calculation.

The frequency response now appears in a window. The default window shows the SWR and reflection coefficient as a function of frequency. Notice that the SWR is in a 50 Ohm system that you set up in the *Preferences* window. If the window shows impedance instead of SWR, use the *Show* tab to toggle back to SWR. The minimum SWR is at 24 MHz as expected since we started off with an antenna that is 6 metres long: too long for the 10 metre band.

Further testing and experimentation

Now that you have a basic antenna file set up and running, it is a good idea to go back and look at the *Geometry* window in some detail as the coordinate system and its views is the most difficult item to understand. The *Geometry* window shows a three dimensional view of the antenna for different elevation and azimuth angles. Open the *Geometry* window and the *Far Field Pattern* window to compare the views. Adjust both to show the same azimuth views so that you can visualise the results. In particular, look at azimuth angles of 0 degrees and 90 degrees for the vertical plot. Other simple changes that you can make are:

- Set the frequency *Step* for the frequency response to 0.5 MHz to make the plot a bit smoother.
- Change the ground type from *Perfect* to *Real Ground* using the editor to see how much gain is lost when a real lossy ground is used.
- Change the position of the voltage source in the *Edit* Window so the antenna now looks like an off-centre fed dipole. Study the SWR.
- Add a wire to the simple dipole to set up a 2 element beam. Make the wire length 5% longer than the dipole and place it 0.1 wavelengths behind the driven element. You will notice that this beam has a rather poor performance with a moderate gain and not a very good front to back ration. We will fix this in part II of the series. If you have trouble creating this file, download my 2 element beam file, TCA Example2.nec, from my website, and run it.
- To make the program easy to use you might want to consider the use of keyboard short cut functions to open several windows and files: <F1> opens the help file, <F6> opens the input file, <F3 opens the Geometry window and <F7> to start the Generate window.

Conclusions

Part 1 of this series discussed how to get started with the 4nec2 simulator. We stuck to a very simple antenna and found its far field pattern and frequency response for two different ground types. Part II of the series continues with the simple antenna to show how to use one of the most important features of the program, optimisation. We then go on to study a two element beam antenna and optimise its performance. For your help, there are five antenna files that are included on my website that you can use for further studies by downloading and running them in 4nec2. These are: a dipole antenna, a 2 element beam antenna, a horizontal loop antenna, a vertical ground plane antenna and a simple circularly polarised antenna.

Further study using TCA Hotlinks

Further information is provided with TCA hotlinks which are easily accessed via the RAC website. For this information, please visit <http://www.rac.ca/tca>. Hotlinks make it unnecessary to type URL addresses into your computer and provide you with calculators and other support that demonstrates the ideas presented in the articles. The following hotlinks for this article are available on the RAC site.

- TCA Hotlink, 1 VE3KL website <http://ve3kl.com/>
- TCA Hotlink, 2 4nec2 website <http://home.ict.nl/~arivoors/>
- TCA Hotlink, 3 NEC2 website <http://www.nec2.org/>

Acknowledgement

The author wishes to thank Arie Voors for reviewing the article and adding several worthwhile comments that add to the ease of using 4nec2.

Until later, VY 73,

David, VE3KL

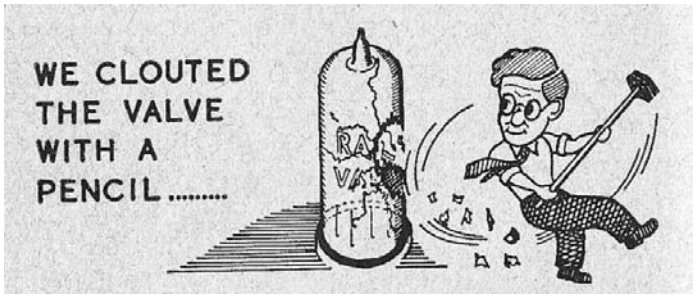
Monitoring Service

Monitoring Service Co-ordinator: John Martin ZL1GWE
<john.martin@nz1.ibm.com>

Greetings to all, including Short Wave Listeners and contributors.

Following on from the last edition, I came across an interesting article called "Fostering Good Neighbour Relations over BCI and TVI" from the *RSGB Bulletin*, May 1957 written by G5GQ and reproduced in the *RSGB Bulletin*.[1] Within this article Basil Wardman explains when he first started Amateur Radio, he was very young and foolish, and stopped all his neighbours to tell them what a clever fellow he was with his own transmitter, able to talk to people in distant lands. In those early days, rigs did interfere with local crystal sets, and Basil being the young Marconi of the locality, was regarded as the public nuisance, responsible not only for his genuine interference, but also for that produced by local trams and overhead wire trains, which existed then.

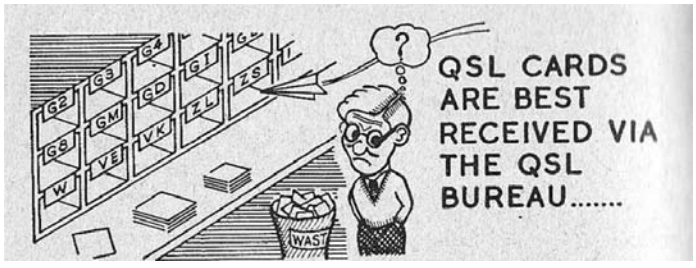
A few years hence, he decided not to make the same mistake again, by making himself anonymous, ie ensuring all QSL cards went via the Bureau rather than addressed to his Amateur Radio station G5GQ.



This way, he could ensure he was not accused of being the target or source of all Broad Cast Interference (BCI) or Television Interference (TVI) including vacuum cleaners, lifts, electric razors etc. He also ensured that his neighbours never saw his equipment, on the basis that misguided neighbours would accuse him of all their woes.

Then there is the matter of positive co-operation. A chance remark from a casual acquaintance results in the fact that he or she is suffering from severe interference. Remember, one's first inclination is to stay quiet, in case unfair blame is put your way. It's far better to face up to it and say "I happen to know a little about radio; ring me next time it happens and I'll pop over and see if I can spot the trouble." Nine times out of ten, it is a simple solution, ie I am not receiving the Third Programme are you? Resulting in the fact, the aerial socket dropped out of the back of the set. A more serious event like a TV, which has lost its sound, is definitely a case of telling the neighbour, the local technician needs to have a look at it, ie never start doing repair jobs. The neighbour was grateful because they received an unbiased opinion. Or the situation where you need to do some tests. "Look," I'll say, "I've just been playing around with my radio and want to make certain that it's not causing any trouble with your TV or radio. Would you mind switching on and listening for the next five minutes?" Note that they are not told what is going to happen, they do not know whether it is phone, CW or digital, so no ideas are put into their heads. That way, they get used to being asked occasionally and, what's more important, they get used to not hearing interference. In other words, the transmitting amateur should try to establish themselves as the co-operative person, who is the last one likely to cause interference.

Then there are the genuine interference jobs, and here it is important to remember that the amateur should help, but not usurp the functions of others. For example, the neighbour rings up and asks where one is having trouble with the broadcast programme that night. Fortunately, G5GQ had also noticed an unusual but very faint ticking in the background, not loud enough to interfere. However, the neighbour declares his noise was so loud as to wipe out the local programme and sounded like a typewriter, but now stopped. So, he asked the neighbour to ring back the next night, if it occurred again and sure enough at 7.30 the next night, he rings in again. So Basil, G5GQ puts on an old receiver and faintly between stations, whilst he was on the phone. They compared them over the phone and then Basil, G5GQ goes down to the neighbours flat and the noise is 70dB louder spoiling his entertainment. A simple test proved it was being caused externally and advised him that it was a genuine case of interference, so it should be reported to the appropriate authorities. The amateur then went back to his own flat and recorded the noise. He went on to play the recording to his neighbour, who was astonished. The amateur then went on to write to the appropriate authorities on behalf of the neighbour with the recording as evidence, along with a covering note stating that he had been asked to assist a neighbour and that it seemed to be a genuine interference case. A few days later the authorities located a neighbouring TV receiver set with a faulty condenser (capacitor). Once more enjoyable reception was available to the neighbour. It is important to co-operate and not interfere. It is not the business of the amateur to do repairs to neighbours equipment; that is a job for the local service person. Remember if you do contact the authorities, give them an accurate report, wrong information causes resentment and hours of additional work, if you actually got it wrong.



Intruder Watcher League Table 2011 (up to April 2011)

Contributor Name/Call sign	Number of reports received	Number of verified reports
John ZL1GWE	315	315
Bob ZL1BAD	109	109
Gary ZL2iFB	25	25
Dallas NZRDXL	10	10
ZL2CC	2	2
ZL1CC	1	1
Luke VK3HJ	1	1
Others	0	0

The contents above, were originally published in the *Bulletin* May 1957, and are reproduced with the kind permission of the *RSGB*.

The very tenet of being a good Short Wave Listener is that of actively listening, this includes licensed Radio Amateurs. Having the ability to listen before one transmits is essential to good conduct. Good DXers always listen, before transmitting; therefore all those involved in radio in general one presumes should be good listeners. This skill does not come easily to some, and it can take a lifetime to obtain the necessary skills through long hours listening to signals, or visualising them. The Monitoring Service can only be successful, if there are sufficient contributors, willing to actively report what you hear to assist the whole community. We are measured in terms of success, by our ability to provide sufficient evidence to the Radio Spectrum Manager or to the IARU Monitoring Service Coordinator within Region 3, Peter VK3MV, so that they can take the necessary desired action, ie the removal of intruders. Peter collates the monthly reports, from the various regional contributors including the NZART reports that I collate on a monthly basis. These reports are shown on the Monitoring Service section of the NZART website. They themselves depend on the quality and accuracy of our reports, which are very important for evidential purposes, even if they are the same intruders year after year as those administrations that have authorised these services cannot turn around and claim that they have not received any reports, therefore legitimising the service.

We have attempted to make it as simple as we can for all those interested in contributing reports to do so regularly. With this in mind, we are commencing an Intruder Watch League Table, with an added bonus; a free annual NZART membership subscription for the person who is judged by the NZART Monitoring Coordinator to be the most prolific and solid Intruder Watcher contributor during 2011. A new NZART award will be provided along with an official certificate of merit of their achievement. The first award will be awarded in November 2011, prior to the annual NZART subscription renewal, which is normally paid in advance, ie 1 January to 31 December. The award will be called the "Top Intruder Watcher Award".

Naturally, I and other recent Monitoring Service Coordinators will be barred from entry to the league table, in terms of fair play, to give everyone one else a fair opportunity. Full details of this new award, will be shown on the NZART web page shortly.

Until next time, keep those reports coming.

John (ZL1GWE)

Report intruders to: <MS@NZART.org.nz> or <MS2@NZART.org.nz> or <IntruderWatch@GoogleGroups.com>

References

[1] RSGB Bulletin May 1957, by Basil Wardman G5GQ

REMEMBER:

Leave a three second pause between overs when using repeaters.

Someone else may have an urgent message.

Amateur Interaction with the COMPASS-1 Satellite

by Alan Cresswell ZL2BX

The Compass-1 satellite is one of the more interesting satellites available for amateur experimentation. This microsatellite was designed and built by students from the Aachen University of Applied Sciences in Aachen, Germany. Launched more than three years ago, it is still functioning well and responding to ground commands. I have acted as a command station for this satellite since its launch three years ago and have had the opportunity to participate in some interesting activities including triggering a number of images from the onboard camera over New Zealand. Unfortunately Compass-1 was not downward looking at those times so I have a collection of images of the spacecraft antenna and little else. After two years operation the control team announced that: "Following the main mission phase the operation of the satellite is now entirely open to radio amateurs with an interest in experiencing satellite communication with the COMPASS-1 CubeSat." The significance of this announcement was to open up the satellite to any amateur station wishing to try satellite command and control operations.

Compass-1 is a cubesat. This has become the de-facto standard for small satellites. The basic cubesat is contained within a 10cm cube with a maximum weight of 1kg. (An alternative configuration is a "triple cubesat" or 10 x 10 x 30cm with a maximum weight of 4kg.) The small size is a bit deceptive as usually a number of 10cm by 10cm circuit boards can be accommodated in the standard cubesat frame. The Delfi-3C satellite (DO-64) for example, apart from the usual on-board experiments, contained a linear transponder for amateur use. Unfortunately the receiver front end died after a few months operation but many SSB contacts were made through this small satellite. More than 60 cubesats have been launched over the last few years and most continue to operate well. Many more are under construction. A typical cubesat contains an uplink command receiver, downlink beacon and telemetry transmitters and an experiment package. Solar panels charge batteries to allow operation when the spacecraft is in eclipse and one face of the cube is usually reserved for antennas. Figure 1 shows Mike (DK3WN) holding the Compass-1 cubesat.

In the case of Compass-1 the uplink command frequency is 145.980 MHz, the beacon is on 437.275 MHz and the telemetry downlink is on 437.405 MHZ. The beacon transmits a series of 26 CW characters every three minutes. A decoder ("Compass-1 CW Telemetry Decoder") can be downloaded from the DK3WN website: <http://www.dk3wn.info/software.shtml>. Plugging the received CW values into the decoder gives the basic satellite housekeeping information as shown in Figure 2.

Table 1

The currently released Compass-1 commands.

DTMF Tones	Description
**30##	Switch to AFSK 1200 bps
**31##	Switch to MSK 2400 bps
**32##	Switch to MSK 4800 bps
**35##	Request a test beacon
**36##	Request a test packet (Ax.25)
**60##	Request housekeeping data (Ax.25)

Command Operations

Commands are sent to Compass-1 using a short sequence of DTMF tones. Table 1 lists the commands that have so far been released for use with this cubesat. A good starting point for amateurs wishing to try commanding the satellite is to request a "Test Beacon". This is triggered by sending the DTMF tone sequence **35## on 145.980MHz. If Compass-1 receives the command it will respond with the 26 character CW sequence on the 437.275MHz beacon frequency.

More comprehensive telemetry data can be downloaded on the 437.405 data channel. The **60## command produces two frames of Housekeeping data as shown in Figure 3. The actual data rate can be 1200bps, 2400bps or 4800bps depending on the current data rate setting. It is normally running at 4800bps. If not, I usually set it to 4800bps over ZL to dump the 640 frames of housekeeping information recorded onboard during the last 24 hours. Check the prime pass over ZL in the mornings to listen to and decode the housekeeping data on the 437.405MHz data channel. Note that Compass-1 will only accept and respond to commands while it is in sunlight however the beacon operates at all times. Decoding the housekeeping data is not entirely straightforward. To get started the best option is to record the data as a KISS file and then use the "Compass Housekeeping Decoder (Compact)" from the DK3WN website. Real time data can be displayed using the "Online Compass Housekeeping Decoder" but it needs a bit more effort to set this up. (Contact me for details if you have an interest in this mode of operation.) Compass-1 is the only satellite completely open for amateurs to experiment with satellite command and control operations.

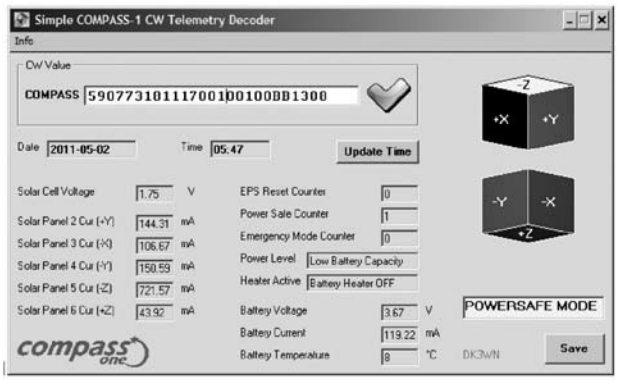


Figure 2. Compass-1 CW decoded.

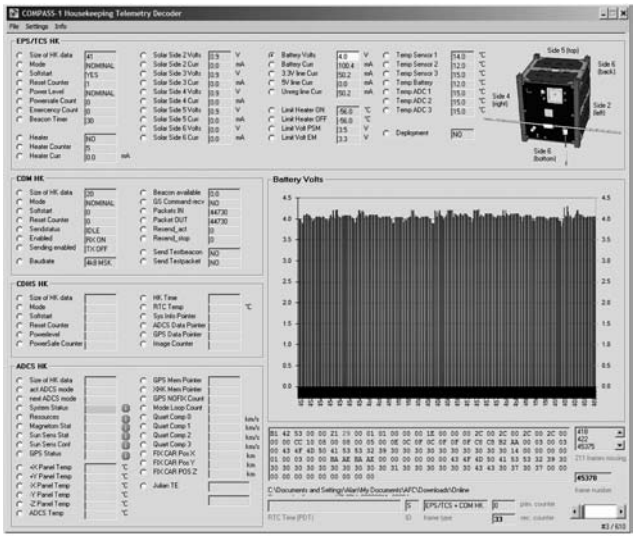


Figure 3. The first frame of the two frames of housekeeping data.

Figure 1. Mike (DK3WN) holding the Compass-1 cubesat.

The Morseman

Gary Bold ZL1AN
<morseman@nzart.org.nz>

A Milestone

This is the 200th Morseman column. I wrote the first in June 1987, after a plea from editor Craig ZL3TLB, for somebody to write a Morse column – despite his stated aversion to "antique codes". I volunteered with some hesitation. I'd been a Morse enthusiast since I was first licensed in 1960, but had no idea how such a column would be received. But I figured that I had enough stories, technical and operating information to keep it going for a year, after which, if nobody was interested, I'd give up.

I need not have worried. Letters immediately began to flood into my mailbox, (email was in its infancy) and I was soon overwhelmed with contributed copy from readers. And to my surprise, this has continued for 23 years.

Recently, I've begun to wonder whether the time has come to retire. Should I gracefully ride over the hill into the sunset? I still seem to have plenty to say, but Morse communication doesn't have the importance that it once did. Am I, like the code, a fossil of a bygone age? When I first became a Ham, we all had to pass a draconian 12 wpm code test, and many of us continued to use Morse, at least occasionally, after qualifying. Then, I often had to search carefully for a vacant frequency to use in the CW segments of 80 and 40. Now, many of the folks I used to rag-chew with have become silent keys, newcomers usually adopt other "more modern" modes, and I often tune over a silent spectrum.

Anyone want to take over this column? Now is the time to make your pitch. Alternatively, if you still think that I say interesting things and want me to continue, you might tell me that too.

The Marconi Enigma

The most controversial Morse signals ever sent were those generated during Guglielmo Marconi's first attempt at transatlantic communication in December 1901. He, Tesla and Popov had already transmitted signals for several hundred km over small hills, but Marconi alone apparently convinced himself that such signals could travel much longer distances, even around the curvature of the earth, between different continents.

Accordingly, he set up sending and receiving stations at Poldhu, in Cornwall, and St Johns, Newfoundland, respectively. This was a distance of 3500 km, an order of magnitude more than anybody had previously achieved, requiring the waves to bend over an "equivalent hill" of ocean about 160 km high. No existing science predicted that this might be possible, as the ionosphere had yet to be discovered – an ionised "reflecting layer" was first suggested a year later by Kennelly and Heaviside, but they had no theory to explain how such a layer might form.

Marconi said that he heard the signals, but did he? And exactly what equipment did he use? Controversy about both of these topics has grown over the years, and today there are many web references, often contradictory, discussing them, and asserting that he either did, might have, or could not possibly have heard them.

You'll often read statements like *"Marconi's experiment created a sensation at the time",* but this is untrue. There's a fascinating paper discussing this transmission, written in 1974 by one of the outstanding radio scientists of the 20th Century, J.A. Ratcliffe, now deceased[1]. After examining the scientific correspondence of the time, Ratcliffe begins his paper on the experiment with the remark "The most striking thing about the scientists and technologists of the time is that they took so little notice of it", quoting remarks from the addresses of two Presidents of the Society of Telegraph Engineers, the most influential communications body of the time, which later became the IEE, then the IEEE. It seems that "traditional" wire telegraphy was so well established that they could see no need for a "wireless" method!

Then the paper becomes absorbing. Ratcliffe gives an in-depth analysis of Marconi's transmitter, based on a detailed description of the original circuit published by Entwhistle, and measurements on re-constructed components of the circuit conducted by his own colleagues – themselves also famous radio scientists at Cambridge.

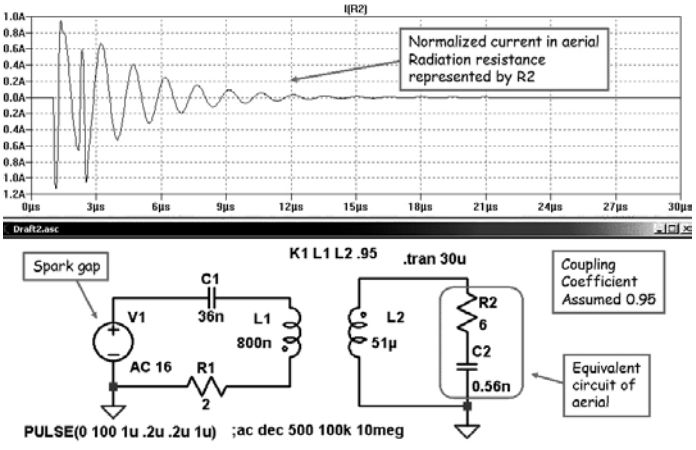


Figure 1.
Top: Simulated spark waveform produced by Marconi's transmitter.
Bottom: Second stage circuit.

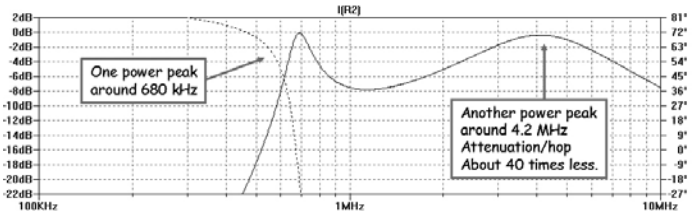


Figure 2. Simulated radiated output spectrum of the transmitter.

Marconi's Equipment and Radiation Spectrum

Realising his own technical limitations, Marconi hired Professor JA Fleming to design a suitable transmitter, and Fleming produced an extraordinary two-stage spark circuit, by far the most powerful yet constructed. You can see a crude schematic of it, drawn by Fleming himself, on the web[2].

This was effectively two spark transmitters in series, the first with a spark-gap of 7.5 mm, the second of 40 mm. These were driven by a 25 kW DC generator, and it's estimated that after each spark, at least 300-500 ms would have been required to recharge the secondary spark-gap to its sparking potential.

Thus, probably only 2-3 sparks/second were generated in the second stage, which would have been coupled to the antenna and transmitted as a series of distinct clicks, quite unlike the "buzz-saw" sound typical of commercial spark transmitters, such as the one on the Titanic, built after the technology matured a decade later. Marconi's receiver was probably an un-tuned "Italian Navy coherer" – although there is also debate about this. The "coherer" was probably just a drop of mercury placed between two electrodes, in series with an antenna, earphones, and (possibly) a biasing battery. This (again probably) acted as a simple rectifier.

Ratcliffe gives a circuit diagram, with probable component values, of the second stage of Marconi's transmitter and antenna, based on Entwhistle's description and his colleague's reconstructions. This is shown in the screen capture of my LTspice simulation of it in the lower window of figure 1. They then calculated the probable transient current in the antenna. But this was well before modern software network analysis algorithms were available, and their calculations would have been laborious and error prone. Now the excellent LTspice software can compute this almost instantly, and much more accurately.

It is known that the second-stage inductors shown were tightly

continued on page 12

continued from page 11

coupled. If the coupling coefficient was as high as 0.95 – just possible according to Ratcliffe – then an LTspice simulation shows that the normalised antenna current of the upper window of figure 1 would result. You can see that two distinct frequencies are superimposed, a higher-frequency one which is rapidly attenuated, and a lower frequency one which lasts for about 10 mSec. This is typical of the transient response of a tightly coupled tuned transformer.

The power spectrum of this transient is shown in figure 2, and we see that the spectral distribution of energy peaks at two frequencies. Energy from the lower peak, in the modern "broadcast band" would have been highly attenuated, but that from the higher, in the HF region, would have travelled via two ionospheric hops and have been much less attenuated – my back-of-the-envelope estimate is about 40 times (16 dB) less. Those running modern propagation prediction software might like to make the calculation accurately, and estimate the path loss at the two frequency peaks.

The second-stage spark gap would have fired at about 100 kV, injecting about 180 Joule of energy into the antenna, giving an instantaneous peak power of the order of 1-10 MW! Based on measurements of Marconi's reconstructed coherer receiver, Ratcliffe concluded that radiation from the lower frequency would suffer too much attenuation to be received, but reception of that from the upper frequency might have been just possible. If so, this is what Marconi, with his un-tuned receiver, might have heard. It would have been the first HF Morse signal!

But what would he have heard? It is known that Marconi ordered that only the letter "S" was to be transmitted, and then only at intervals, since he feared that prolonged key-down periods would blow the transmitter up. One reference states that the transmitter was keyed by a mechanical device, probably driven by clockwork, but I can find no reference to the speed, or probable length of the resulting dits. Thus it's probable that Marconi heard, if he heard anything, one, or at most a few impulsive clicks in the headphones for each dit. Surely a very difficult signal to recognise in the background noise!

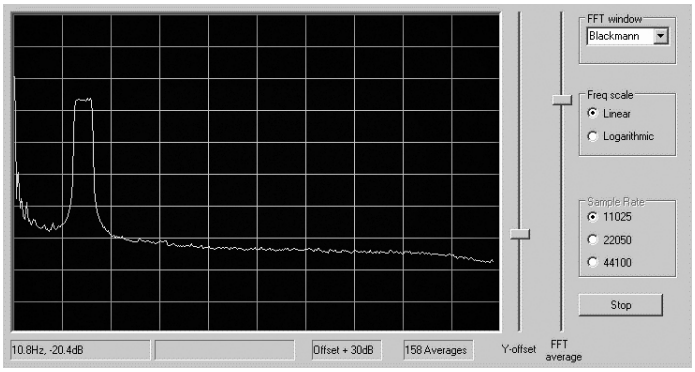


Figure 3. Operating window of Con's "Spectrum" program.

Conclusion

We will never know whether Marconi really did hear these weak, transient signals. He was very sparing with technical details, (hence my extensive use of "probable" in my analysis above) and his description of the experiment changed somewhat in subsequent years. But he convinced himself, and others, that he had heard it, and this enabled him to procure funding and enormously expand his Wireless Telegraph and Signal Company, which he had founded in 1897. It was through this communication network that the "Marconi men", Jack Phillips and Harold Bride, sent out the distress signals in 1912 from the sinking Titanic. You can read a summary of this here[3].

ZL2AFP Software Bandpass Filter

In 2000, Lionel, G3PPT released a software audio CW band-pass filter program called *"Binster"*. This is no longer available, but it was so unusual that I asked Con, ZL2AFP to write a similar one. Con has, and it's downloadable from my website[4]. The "help" file has complete instructions.

Connect the audio (phone jack) output of your receiver to the line input socket of the computer and run the program. You'll see a frequency-domain window running from DC to 2695 Hz, scrolling downwards, with white tracks marking CW signals audible within this band. The audio should now come through the computer sound-card.

Passing the mouse over the screen shows the frequency, in increments of 4 Hz. Clicking the left/right mouse buttons sets lower/upper band-pass frequency limits, shown by red/yellow lines, anywhere within the window. All signals between these lines are passed unattenuated, those outside are zapped.

And really zapped! Figure 3 shows the filter characteristics resulting from setting a pass-band from 700 to 900 Hz. I obtained this plot by running the filter program on one computer, and recording the response on another using Con's other program, "Spectrum analyser", described last month, and also downloadable from my website. You'll see that the skirts are really steep, and signals only 4 Hz (1 frequency increment) outside this range just vanish!

This type of band-pass response is usually obtained in software using an IIR algorithm[5]. These are relatively easy to program, but the characteristics are similar to those of analogue filters, and obtaining the sharp response similar to Con's filter would be almost impossible without enormous computational effort on a PC. Instead, Con, like Lionel, used FFT filtering. A segment of the signal is sampled, and transformed to the frequency domain with an FFT. Unwanted frequency bins are simply zeroed, and the result transformed back with an IFFT to the time domain.

This results in very sharp filtering, but all you get is a "snapshot" of one time segment. To obtain a continuous audio output you have to use overlapping FFTs, clever windowing techniques, and some fancy footwork connecting the separate filtered segments. Con has achieved this remarkably well, and the resulting filter is as good as, or better than, those achieved by dedicated hardware DSP filters. As far as I know, it's unique, in that it's completely free and runs on all PC operating systems including 64-bit Windows 7.

It's fascinating to apply it on highly-occupied CW segments of 40 and 20 metres. Often, particularly if a contest is running, several signals are audible within the receiver passband, and this filter allows all except one to be removed. You might be interested to compare this filter with whatever your receiver supplies.

The sound-card settings, output volume and screen brightness can be adjusted from the program. Passband limits are shown in boxes below the window. Alternatively, you can select a "band reject" characteristic, which zaps signals within a set bandwidth. This is useful for zeroing an annoying carrier on top of an SSB signal.

Last Month's Problem

See figure 4(a). For a voltage to be induced in the toroid, a current must flow in the "single wire" shown threading the toroid. This wire must therefore be part of a closed "winding", but it is not obvious where the return current path is. In fact, it's through the outer braid of the coaxial cable. This is rarely made clear, and has confused many.

Must the single wire be exactly in the centre of the toroid? Astonishingly, if the toroidal winding is uniformly wound, the mutual inductance between the wire and the complete toroidal winding is independent, theoretically, of where the wire threads the toroid! That is, it doesn't have to be in the centre, it just has to go through somewhere. This can be deduced from Ampere's Circuital Law, but the reasoning isn't obvious. See the expanded solution on my website for a full explanation.

But that's only the case for the complete winding. The configuration conventionally used in the Bruene-type SWR bridge splits the toroidal winding into two portions[6], and now the wire position does matter. If it's not central, then the half-winding closest to the threading wire will have a greater

Review: The *bhi* NEDSP-1062 Noise Reduction unit

by Eion Gibson, ZL3AG

Back in the early 90's when I used to buy the odd bookshop copy of CQ *magazine, I had been following the glowing comments about speaker in-line DSP noise reduction units.*

At that time I was running a Kenwood TS430S and eventually weakened to the curiosity and purchased a Timewave® DSP 9+ unit from the USA. It served well for a number of years but really could only make a good signal better and not a bad to good.

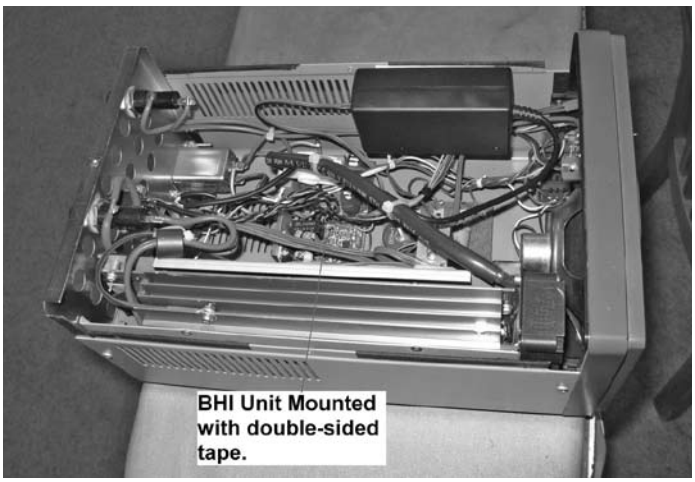
During the millennium year 2000, my work had taken me to Iran and when coming home through Singapore, like many hams before and past, called into the Blazer Electronics cave in the basement of Sim Lim Towers. I purchased a new IC746 which had IF based DSP noise reduction. It proved to perform better than the Timewave® which I then sold.

About 2005, stories were rolling about the UK designed *bhi* units and how wonderful they were. I rang Tony, ZL3HAM, who had one, to get his opinion of the performance. Tony related that he had got the 'install-yourself' unit rather than the integral speaker unit. Tony said it was the best and most useful station accessory he had. Tony said to call sometime and experience it. I trusted Tony's views and promptly bought one from the W4RT site in the USA. That source came in cheaper than from BHI in the UK. (All using the same DSP engine.)

I got the NEDSP-1062 and installed it in a Kenwood SP230 speaker box I used when running a TS830S in the early eighties. That speaker box also houses now a small switch-mode supply to power the 746. A morning's work had it all in and going.

The results were well worth the few hundred dollars spent. It is so effective reducing noise that I could run the 746 on FM with no signal present and open the squelch fully. That noise would eventually strip wallpaper. With the BHI engaged and at an advanced reduction setting the noise can be completely eliminated. The *bhi* DSP digitally processes the incoming audio signal and then differentiates the speech from the noise. The unwanted noise and interference are then attenuated to leave only the speech.

In normal use I run it at setting 6 giving good noise reduction and retaining audio fidelity. The results are outstanding. It can make a poor signal good and performs far better than the IC746's IF DSP action. Both functions in series are astounding. I have a large doublet antenna for HF, fed with open-wire feeders. It no doubt collects from the neighbourhood a plethora-of-plasmas, but the BHI wins.



The key pad unit which comes with the board. The by-pass key is self-explanatory. The Function button disengages the noise reduction. Holding it in activates a tone sender and counts the level of noise reduction from 1 – 8 (max).

I have demonstrated the unit to many visiting Hams and it never fails to drop jaws! If you are looking for a small, not too expensive project, get one of these, you will be astounded. βi

For specs etc see: <www.bhi-ltd.com> and <www.w4rt.com>.

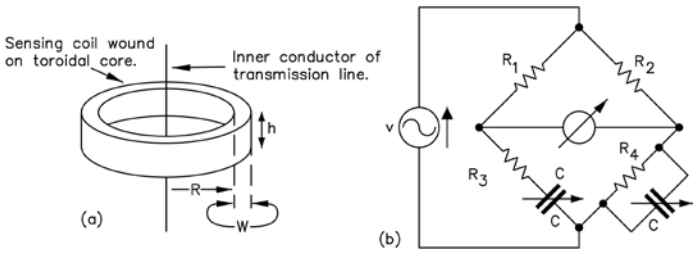


Figure 4. Left: last month's problem. Right: this month's problem.

mutual inductance, and the voltage induced in it will be higher than in the other. In practice, this doesn't matter either, because "sensitivity potentiometers" are always included to adjust the voltages during calibration. There's another calibration control too, usually a small variable capacitor, which is used to set the "reverse" voltage to zero when the correct load resistance – usually 50Ω – is connected. This is always set at the factory, and most of us assume that it doesn't need adjusting, particularly since SWR bridge manuals usually don't even mention it. But you will see it on your bridge's schematic, and can tweak it if you're suspicious.

This Month's problem.

Figure 4(b) shows the schematic of an ac bridge circuit, energised by the sinusoidal voltage source at left. The two capacitors labelled "C" are ganged, so that the values of both can be varied simultaneously and are always equal. What is the name of this bridge? What quantity is it used to measure? Derive the balance conditions, and show that if the resistor values are chosen appropriately, only one control (the ganged capacitor) can be used to obtain a balance.

References

[1] Ratcliffe's paper was published in *Proc. IEE,* Vol 121, No. 3, September 1974

[2] Fleming's spark transmitter <http://www.ieee.ca/millennium/radio/radio_differences.html>

[3] Signals from the Titanic <http://www.titanic-lore.info/Wireless-shack.htm>

[4] See "ZL2AFP FFT filter" at <http://www.qsl.net/zl1an/index.html>

[5] IIR filters are described at <http://en.wikipedia.org/wiki/Infinite_impulse_response>

[6] See analysis of the Bruene SWR bridge at <http://www.qsl.net/zl1an/index.html>

Review of Current Resistor Technology

By Peter Bower GM3OFT

(Reprinted with permission from OTNews, *Autumn 2010, p15 – 18)*

Most of us have, at one time or other, built, tested and used our own equipment. Whether it was a simple test rig, an amplifier or a complex transceiver, one of the most common components involved in the construction of anything 'electronic' is resistors. They are available in so many different forms that choice of the best component for the job is not always a straightforward decision. Many factors and component parameters influence the overall performance of electronic equipment, not the least of which is an understanding of the current-noise characteristics of resistors. This is especially important in the design of VHF amplifiers and top quality audio amplifiers. Instruments alone cannot measure the clarity of sound reproduction of the latter. Only the trained 'golden ears'? of an audio engineer can detect the subtle changes between different distortion-free signals. With the latest manufacturing technologies, current noise, as well as unwanted inductance, can be virtually eliminated as shown in Figure 1 and Figure 2.

Current noise

The collection and dispersal of electrons within the current flow path produce this noise. It varies significantly and widely with the design and construction of resistors. The current noise, measured as a function of the noise voltage in microvolts per volt applied, produces a noise index, which is measured in decibels (dB). This is calculated from the expression:

dB = 20 x log {noise voltage/ DC voltage}

The full range of noise indices achieved by different resistor technologies varies from a very noisy +10dB at 3.2 µV/V to a virtually silent -40dB at 0.01 µV/V.

In days of yore the only resistors available to radio amateurs for home construction were of either wirewound or carbon composition. Not so today; over time, Thick Film, Metal Film, Bulk Metal Film and Naked Z-Foil resistors have been added to the range of available technologies. The wide range of Noise Indices available is shown in Table 1. I will endeavour to describe briefly the construction and noise properties of each of these types.

Carbon composition and carbon film

Most 'Old Timers' will be very familiar with this type of resistor, because for many years they were the only type of general purpose low power resistors available for home construction projects. These noisiest of resistors use a diallyl phthalate plastic binder and the conductive path is from carbon particle to particle, which while creating 'noise' also results in a very low self-inductance. The binder is subject to mechanical movement relative to the carbon particles, caused by voltage strain, moisture ingress or thermal strain, allowing the current to bounce from particle to particle thereby producing the characteristic 'popcorn' noise heard in audio amplifiers. Carbon Film resistors have gradually replaced solid composition resistors, being more accurate and having better stability. They have been most popular for low power applications from a safety point of view because of their heat radiation and fire retardation properties. However, as well as being characteristically noisy, they are not particularly stable with time and temperature when compared with more modern equivalents.

Metal oxide film

Unlike more recent metal film resistors, this type of resistor incorporates a stable ceramic core coated with a metal oxide such as Tin Oxide. The oxide particles touch one another along the conductive path in the fired glass binder, causing noisy aggregation and dispersal of electrons. The construction is inductive as shown in this partially stripped view, which limits their high frequency applications.

Figure 3. Metal oxide film resistor.

Figure 4. Metal film resistor.

The noise index range is acceptable for general-purpose use, and although more expensive, they excel Composition and Carbon Film resistors in temperature, current noise, linearity and accuracy. The oxide film does not burn and they need careful mounting because they radiate significant heat.

Thick film

These present a marginal improvement in accuracy and stability over carbon composition and film resistors. The conductive path is a Glass Frit and Ruthenium or Nichrome combination screened onto a ceramic substrate, which has low inductance similar to composition resistors.

Metal film

Unlike carbon film resistors, these incorporate a stable ceramic core coated with a resistive metal alloy such as Nichrome. They excel carbon film resistors in all aspects of temperature, current noise, linearity and accuracy. They are readily available at competitive prices, but are limited by the lack of high ohmic values.

Wirewound

Winding fine metal alloy wires, of various resistivities, onto a ceramic bobbin makes these. Only the tabs that connect the fine resistive wire to the external leads produce noise. They are unsuitable for RF and most audio uses because the

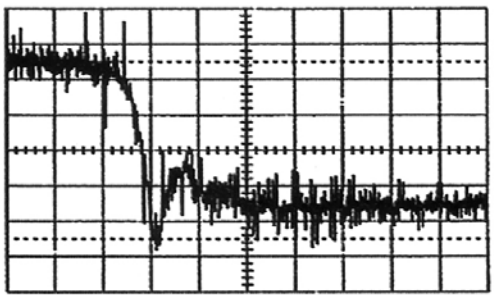


Figure 1. Typical waveform with inserted noise.

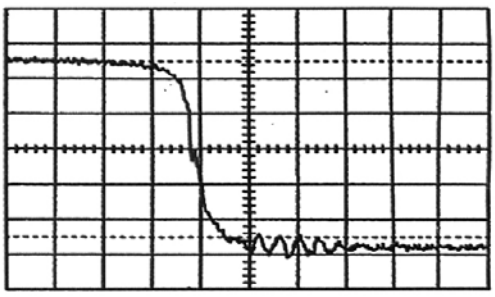


Figure 2. Waveform of noise free resistors.

Table 1

Type of construction	Noise Index; from (dB)	µV/V	Noise Index to (dB)	µV/V	Inductance factor
Composition	+10	3.2	-10	0.32	Good
Metal oxide	+3	1.0	-15	0.15	Poor
Metal film	-10	0.32	-20	0.10	Good
Wirewound	-35	0.018	-38	0.014	Very Poor
Bulk metal foil	-40	0.010	-43	0.006	Very Good
Naked Z-foil	-43	0.0060	c.-50	c.0.0010	Excellent

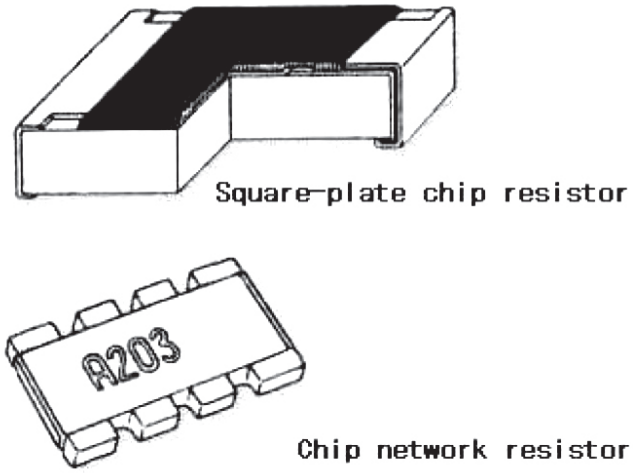


Figure 5. Bulk metal foil resistor.

high inductance produced by the wound construction chops signal peaks and does not accurately replicate higher harmonics. In general these are inductive 'quiet' resistors, produced in a very wide range of sizes and power dissipations.

Bulk metal foil

These resistors, patented by Vishay, are pattern etched into metal alloys and have intergranular boundaries between metallic crystals in the alloy. The planar two-axis design allows the current paths to be laid out in parallel, producing virtually zero noise and inductance. This planar layout also gives a minimum self-capacitance. They have no measurable peak to peak distortion or insertion noise, the index being less than -40dB.

Naked Z-foil

The very latest devices in bulk metal foil technology, combining the lowest noise with virtually zero inductance. They add a new dimension to surface mount packages. A thin varnish coating, thereby creating a 'naked' resistor replaces conventional encapsulation. Even 'Golden Eared' audio specialists agree that elimination of encapsulation does produce a detectable improvement in audio amplifier sound clarity. The noise index is only measureable using special techniques and is significantly less than -40dB. βi

Useful website references:

<http://en.wikipedia.org/wiki/Resistor>
<http://www.welwyn-tt.co.uk/>
<http://www.vishay.com/company/brands/foil-resi>
<http://www.electronicstalk.com/news/ccr/ccr100.html>
<http://www.electronicstalk.com/news/ccr/ccr109.html>

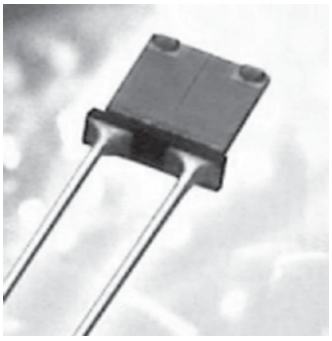
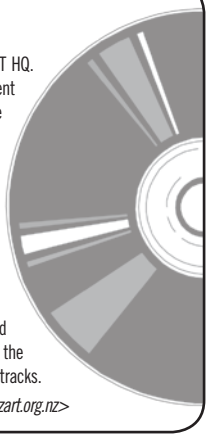


Figure 6. Naked Z-foil resistor ¼W.

NZART Examination Training DVD



The series of 15 DVDs have been completed and are available via NZART HQ. This series is very much an individual's (mine!) interpretation of how to present the material. I have kept the scripting fairly informal in order to maintain the material similar to how I would teach a class in person. I have checked the material and hopefully there are no obvious errors. The level of material is at, or a little above, the question bank for the exam. In order to teach material of any kind you do need to go a little above the level of the examination at times for clarity of explanation. The introduction on DVD1 covers this.

The technical quality is quite acceptable although some of the earlier material is a little low in video resolution but still adequate; this was due to the learning curve in the process of going from digital tape to DVD.

Any suggestions/constructive criticisms are welcome, please email me. I would like to acknowledge the invaluable assistance given by Grant Simpson ZL2BK in the technical production and Jim Meachen ZL2BHF in cleaning up a few rogue soundtracks.

Stuart Watchman ZL2TW <zl2tw@nzart.org.nz>

NZART Radio Science Education Trust

Application for Grant-in-Aid

Applications are invited from secondary school science teachers and other training providers for Grants-in-Aid from the NZART Radioscience Education Trust to promote the development of projects in the general areas of radio and/or electronics. It is anticipated that these projects will lead to entries in the local area Science and Technology Fair. Grants will not normally exceed $250.00

Applications should normally be received no later than 30th April of the year of application. Application forms may be obtained from:

The Trustees, NZART Radioscience Education Trust, PO Box 1733, Christchurch 8140, or from <trustee@nzart.org.nz>. Applications should be endorsed by the Head of Science or, for other organisations, the President/Chairperson.

Old Timers' Club

Roy Symon ZL2KH
<zl2kh@xtra.co.nz>

Secretary/Treasurer:
Roy Symon, ZL2KH
Mail:
25 Annandale St,
New Plymouth
Phone:
06-758-2156
E-mail:
<zl2kh@xtra.co.nz>
Monday evening SSB Net:
Net details: 2030 hr (local time) each Monday – on 3.870 MHz LSB.

Once again no OTC member has seen fit to send in any material for this page. Please send in something; a description of your interests in amateur radio, how you got started, what gear you use, in fact, anything at all that could be of interest to members. It would be even better if you could include some good sized digital photos (600 kb or bigger). I am planning that the next issue will include a report of the happenings at the OTC AGM in Silverstream.

New Members

There is one new member to welcome this month. He is:

- 1278, ZL3DM, Dave McGuire, Waihi Beach.

Dave and I go way back; back to school days at Hawera Technical High School, so it is a thrill for me to have him join OTC.

Silent Keys

There are four members to farewell this month. They are:

- 918, ZL1RT, Denis Maginnity, Hamilton
- 1022, ZL2CLI, Eric McArthur, Carterton
- 942, ZL2FS, Jim Priest, New Plymouth
- 445, ZL2FR, Nelson Dyett, Wellington

There was a great turn-out of local amateurs at Jim Priest's funeral; and we all formed a guard of honour when the casket was carried out. Jim will be missed at Branch 27 gatherings. As is usual, I sent the families concerned a sympathy card from OTC members.

Certificates sent out:

There has just been one long service certificate issued.

60 Year Certificates:

- 836, ZL1AHP, Les Greendale, Paihia

Congratulations to Les.

Roy Symon ZL2KH
OTC Scribe

Knight's Point Mini VHF DXpedition;
experiences of VHF DXing on the southern West Coast

by David Mulder ZL4DK

After the December VHF contest Terry ZL4TAE suggested we think about doing a mini-DXpedition and participating in the VK summer VHF contest. That sparked the idea of a trip to the West Coast. Not only would the VK9NA team be at Norfolk Island but Steve ZL1TPH would be at the top of the North Island and that was the final twist of my arm.

The location we chose to go to was Knight's Point about 25 km north-east of Haast and about 230km south-west of Greymouth. It consists of a small car park area, a tourist lookout shelter, a public toilet, and a monument commemorating the completion of the last part of the road linking Westland with Otago. It is a very popular stop for tourists and tourist buses, partly, because it offers a view out over the cliffs of the rugged south Westland coastline, but mainly because it's one of the few public toilets (if not the only) on the 120 km drive between Haast and Fox Glacier.

What makes Knight's Point an interesting place for VHF is that it sits on the top of a 140m high cliff on the West Coast with a clear sea path to Australia (and Norfolk Island). It also is far enough west to be a clear sea path to Auckland. However to cover the distances to Auckland, Australia, or Norfolk Island on VHF or above would require some significantly enhanced conditions and some luck in timing to score such conditions. I had visited Knight's Point in the past hoping to make some great contacts and only managed a handful of VK contacts on 6 metres.

I decided that to make the trip worthwhile and improve the chance of striking some good VHF propagation conditions, I would arrive a little early, and spend a couple of extra nights; not just the weekend of the contest. This also suited Terry as he had some work to do over on the coast. So I packed the car and trailer and headed over on Thursday (13 January 2011). After the six hour drive from Dunedin, I called Terry on 144.5 FM as I approached the town of Haast (no repeaters!). Nothing but a weak breaking of the squelch in reply suggested Terry was still some distance away but to my surprise I found Terry standing beside his truck on the roadside a couple of bends later. He questioned my receiver as he had heard me very clearly but he later found out that the FM transmitter in his vehicle had a blown PA and he was putting out only a few mW.

While discussing our plans on the side of the road at Haast I thought I heard some weak SSB on 144.1 MHz. I assumed it was a Greymouth or other West Coast station. Terry had some work to do south of Haast and I was keen to head to Knight's Point and get set-up. So we arranged to head in different directions and Terry would meet up with me the following evening.

Once back in the car and driving through the Haast township in order to pick up some sunscreen (yes, the weather was surprisingly fine), I discovered that the SSB signals I heard were actually VK stations and I managed to work a couple of them on the 5/8 whip on the car. I headed on up the Coast very pleased with these initial contacts and hoping that I would not be arriving too late to catch some of the good conditions.

At Knight's Point, I found the layout of the area was very different from the simple open parking area of 15 years ago when I had last visited. The car parking area was now laid with kerb and channelling and parking spaces for vehicles and busses well marked out on the seal. A dozen or so vehicles were there at any one time and there was a regular turnover of traffic coming and going. Finding a place to park the car that had space to set-up aerials with a clear view out over the sea was going to be next to impossible. I also did not look forward to the steady stream of questions about what I was doing that I was likely to get from the tourist traffic. Terry had checked the site last year and warned me of this, so following his advice I back-tracked about 300m to a large lay-by. A nice flat area towards the cliffs had space for two cars, caravan and aerials. Trees blocked the view to the north slightly but there was a clear view out over the sea to the west.

Terry's caravan and 9-over-9 2 metre array.

I rigged aerials for 6m and 2m. The mast has a simple rotator driven by a windscreen wiper motor and a large pinion rotates the mast. This is a great device to avoid exposure to rain and the persistent sand-flies.

With VHF aerials in the air I then took some time to listen to the bands to see what conditions were still about. There was no sign of anything on 2 m anymore, but 6 m was busy with many VK stations. I worked a few of them and also contacted Bob ZL3TY in Greymouth. Bob confirmed that the earlier opening on 2 m was a sporadic E event (some stations on the East Coast of the South Island had also managed a couple of VK contacts).

For 70cm and 23cm I use a homemade 3 metre, stressed mesh, dish which mounts on the side of my trailer. However I discovered that I had forgotten a small piece of aluminium pipe that forms part of the mount but what handy Kiwi doesn't take a few tools on a FD trip? Some local timber was fashioned into a replacement part. I managed to assemble the ribs of the dish but by now it was getting a little too dark to complete the fiddly job of tying the mesh to the dish. I climbed back into the car, had a quick contact with Terry in his caravan at Neil's Beach then settled down for the night.

Friday morning I finished applying the mesh on the dish and then had another look at the bands; 6 m was quiet so I swung

The dish pointing to VK.

the beam north and put out a few CW calls on 2m. Much to my surprise I heard a very faint SSB reply. I couldn't identify the station but could clearly hear that he had a "K" beep on his PTT release. Eventually I concluded that he was trying to answer me and I swung the aerial around to peak up the signal as best I could. After many repeats of his call-sign and amongst the QSB and occasional meteor pings I discovered it was Stephen ZL1TPH at the top of the North Island (about 1000km away). Eventually we even managed to exchange signal reports and it was obvious that Steve was hearing me a little better than I could hear him. (I know my receiver could do with a better preamp. Steve, I am working on one.)

As the day progressed 6 metres opened up to VK via Sporadic E and by 2pm it again reached 2m. I managed to work a number of VK stations on 2m including the VK9NA team on Norfolk Island.

In the early evening the sporadic E had quietened down again and even 6m was quiet. I was tuning around and found a very strong station on 2m. I assumed it was perhaps another Greymouth station talking to ZL3TY (the signal appeared to be coming from the north). However when he finished his over, I found I could not hear the station he was working. I broke in with my call-sign and discovered that the strong station was Brian ZL1AVZ in Auckland. The station I could not hear was in Taranaki and shielded from me by Mount Egmont. Unlike the previous sporadic E openings this was a tropospheric ducting opening. Signals with Brian were so good on 2m we decided to try 1296 MHz. We could faintly hear snippets of each other's SSB signals on 1296 MHz but not enough to establish usable communications amongst the QSB. We sent carriers to each other and attempted to peak aerials up with little improvement. No doubt the vegetation my aerial was pointing at was soaking up a significant chunk of the signal. Eventually we resorted to CW to exchange call-signs and reports. I was overjoyed to make such a long distance contact on 1296 MHz with my simple homebuilt rig.

Terry then turned up with his small caravan and I helped him put up his pair of 9 element Yagis for 2m. When he swung these to the east we found the "Tropo" duct was now open across to VK and Terry began working a number of VK stations on 2m including VK4OX. Some of these stations were interested in trying 70cm so I swung the dish west and changed the feed aerial to 70cm. Unfortunately I forgot to shift the coax from the 1296Hz rig to the 70cm one so wasted a lot of time listening to a rig with no aerial connected. (I was also lucky not to damage the 70cm amplifier.)

A couple of the VK stations also asked to try 1296 MHz but nothing was heard. When I got out of the car to switch from 1296 back to the 70 cm dish feed I bumped the rotator for the VHF Yagis. I spotted the coax well wrapped around the pole, the aerials still turning then bang, the mast snapped and the lot came down just as I got to the off switch.

Fortunately the only real damage was to the bottom section of the pole. A few bent elements on the aerials were easily straightened and even the coax unwound without any sign of damage. I lashed the remaining top part of the pole to a Waratah® and soon had the aerial back up almost to the original height. By this time the opening was over. I had missed out on managing any VK contacts on 70 cm or 1296 MHz but at least could look forward to a much more comfortable night sleeping in the caravan.

The next morning we tried working 2m meteor scatter across to VK and easily managed a contact with Rex VK7MO. We heard pings also from VK2AMS and VK1WJ but were unable to complete QSOs with these stations.

Conditions over the Saturday and Sunday were well down on what we had experienced the previous two days. However we managed to make a total of about 40 contest contacts with VK stations on 6 metres. We did hear some faint signals on 2m but nothing more. However we discovered an intermittent short circuit in the control cable to the 2m linear amplifier which held the amplifier in the transmit mode and prevented us from receiving anything at times. The weather had also gone downhill over the weekend and was now raining lightly on and off.

We packed up on Sunday afternoon getting slightly damp in the process and headed home very happy with the contacts we had made. If you have never driven over the Haast Pass, it is a trip I can well recommend. There are some spectacular changes in scenery between the West Coast and Central Otago. Terry stopped at his holiday home in Central Otago but I carried on home to Dunedin to face work again on Monday.

All-in-all it was a well worth while trip. A few lessons were learnt including; limit switches on rotators are a good idea, and I definitely need to finish building my new 2m preamp. Was it just luck or did the sacrifices of human blood to the local tribe of sand-flies have anything to do with the good propagation? Thank you to all the stations we worked, thank you to Bob ZL3TY for being there when there was no one else to talk to and relaying the occasional message onto VKlogger, thank you to Peter ZL4LV for the loan of the generator, and thank you Terry ZL4TAE for suggesting the idea and providing some comfortable accommodation.

Equipment Used

6 metres; TS680 and homebuilt 80watt amplifier, 3 element Yagi.

2 metres; TR751A and 150Watt amplifier, 2 x 9 element Yagis.

70 cm; TR851A and homebuilt 100Watt amplifier, 3 metre dish.

23 cm; Homebuilt zero IF rig <http://lea.hamradio.si/~s53mv/zifssb/lscband.html> and 10 watt amplifier using a RA18H1213G power module, 3 metre dish. βi

ZL4DK and a few radios in the car.

Satellite Orbits

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AO-51 status

For now, it looks like the PL tone management (and changes to other settings) has helped to keep the amateur radio satellite AO-51 running and supporting normal operations.

It is now running around 475 mW of power out on 435.300 MHz. The current power budget makes it very hard to run both transmitters at the same time. Also, the control station is trying to keep the amount of commanding to a minimum, by using the single transmitter for both voice and telemetry. This means that telemetry data which sounds like noise can sometimes be heard on the downlink. However I expect that this only happens when the satellite is over the USA.

Reports on the AMSAT bulletin board indicate that SO-67 is again operational and putting out a strong signal on 435.345 MHz FM. The SO-67 Frequencies are; Uplink: 145.875 MHz FM, Downlink: 435.345 MHz FM, Activation tones: 233.6 Hz, Parrot: 218.1 Hz.

Kevin Gordon ZL1BGK has been busy building a cross-polarised 2 metre antenna based on a design by Derek G4CQM (see photos). He has also had a problem with his M2 elevation rotator. He writes; "In the last super 160 kph storm my elevator was damaged. The motor shorted against the outer cover. M2 Antenna agreed yesterday (after about three months com) to provide a new motor which they conceded that I may install myself. I am hoping that the replacement parts will be dispatched shortly."

NASA Voyager video

NASA has released a YouTube video about the two Voyager probes that are now leaving the Solar System and are on the doorstep of interstellar space. The Voyager probes were launched in 1977. In March 2006, Signals from Voyager 1 were received by Radio Amateurs in Germany at a distance of 14.7 billion km from earth. <http://www.youtube.com/watch?v=oFT68U4i-Xw&feature=player_embedded>.

ZL1BGK 2m cross-polarised Yagi on tower.

ZL1BGK's VHF Yagi antennas on roof.

Astronaut Cady Coleman – installed the new 2m ARISS radio on the ISS.

The 20m dish at Bochum which received signals from Voyager 1 at more than 14.7 billion kilometres from Earth.

ISS

Astronaut Cady Coleman completed the installation of the original ARISS Ericsson radio in the Columbus Orbital Laboratory, connecting it to a 2 m/70 cm antenna installed last year via EVA and creating the second amateur radio station aboard the ISS. Astronaut Paolo Nespoli checked out the radio's audio for proper functioning by talking with ham operators on the ground. In addition to this second station, the Amateur Radio – Columbus (ARCOL) Working Group has already accomplished the assembly and installation of the L- and S-band patch antennas mounted on the exterior of the Columbus Module to be used with future radio systems to be launched to the ISS.

Get your call-sign to Mars. NASA is collecting names to be put on a microchip that'll be onboard the Mars Science Laboratory rover heading to Mars in the fall of 2011. Some Radio Amateurs have been adding their call-sign to last name field. You can add your name and call on the Mars microchip at: <http://tinyurl.com/marsham>.

Allan ZL2BX has sent me an update on his activities and a photo of his satellite antennas. Most of us can only dream of such a sophisticated antenna setup! "All the usual satellite activities here. Most activity these days is on AO-51 and AO-07. VO-52 is a bit late in the morning / evening now for most people so not too many contacts there lately. HO-68 has not been on for some time and SO-67 is now only on in this part of the world

ZL2BX Satellite Antennas.

one week in four. Very little ZL activity and almost all contacts have been with VK where a number of new stations have appeared on AO-51. Kevin, VK0KEV has been active from Macquarie Island and I have worked him a few times on AO-51. ARISSAT-1 is now at the ISS and awaiting deployment in July. It was turned on for about 24 hours on the 11th February and I received good signals on four or five passes over ZL. There were various voice announcements and I received two slow-scan images. Neither of the transponders was active. Next activity is planned for 12 April.

In the last couple of months I have had requests to help out with command activities for a number of cubesats. As well as the daily data dumps etc. with Compass there has been command activity with RAX and TISat. The hope with RAX was that the beacon could be restarted by sending commands to it in the first thirty seconds after it came out of eclipse south of New Zealand. So far however the beacon has remained silent. Along with data support for a number of other cubesats it has been a busy few weeks. I now have two completely independent satellite systems operating and at times both have been in use either monitoring two separate satellites or, in some cases, monitoring two separate downlinks from the same satellite. That seems to be it for the last two months,

73 *Allan ZL2BX*

Sounds from Amateur Radio Satellites

DD1US has a website containing 'sounds from space' it has many interesting recordings of all sorts of space signals including EME signals, satellite QSOs and signals many from different satellites dating back to OSCAR1, and signals from manned spacecraft. <http://www.dd1us.de/spacesounds%202.html>.

References

Southgate ARC website, AMSAT, websites. Please send me any news, feedback, requests, questions, hints, ideas, construction projects, interesting new purchases or whatever. I always need updates on the local activity, <zl3dw@nzart.org.nz>

73 *Andrew ZL3DW*

Around the Branches

Christchurch Amateur Radio Club, Branch 05

RadioTek–A day of radio technology

On Sunday 1 May, Christchurch Branch05 held another RadioTek day in their battered but perfectly formed clubrooms in Avonside. Despite the main rooms having sunk 20cm in the earthquake, the building was inspected and passed fit for public access. We welcomed ten students, half of whom had previously attended a RadioTek day. One student was proud to be an octogenarian.

For the "first time" students the day started, as usual, with an introduction to how radio works, which was followed by kit building for the rest of the day, our trusty steady hand game and a basic AM radio receiver. Once the radio was finished some experiments were carried out to run it from various power sources, including solar power, model steam driven generator and a Kiwi Fruit battery.

The second timers were given some tuition on electricity and how to operate radios, and then in the afternoon they built a speaker amplifier for their previously built AM radio. It was good to see some second timers bringing their radios, and other electrical toys, back to RadioTek for us for repair.

In the afternoon we were visited by a journalist to learn more about our program, and we hope this will add to the existing publicity. The activities of the day concluded with an exercise to put up an HF aerial in the local park, and make some contacts on 40m as well as the local repeaters.

At the end of the day, we had ten very happy students and parents, going home with fully working projects. I would like to thank the team; Rory ZL3HB, Graeme ZL3GSL, Brian ZL2BAT, Barry ZL3BMW, David ZL2IC, Jason ZL3LD, Aidan ZL3APB, Ron ZL3RON and Ken Judd. As a small measure of success, two students came along to the club meeting two days later to find out more about Amateur Radio.

Further RadioTek days are scheduled for 14 August and 13 November this year, so if you want to help us spread the word, the booking contact details for these are Rory Deans 03 3254181 or <rory1@xtra.co.nz> with a website at <http://www.radiotek.org.nz/>.

Kelvin Barnsdale ZL3KB

Christchurch Amateur Radio Club, Branch 05

On Tuesday 26 April Oliver Jenks (13) passed his Amateur exam at the Br05 clubrooms with a score of 50/60. As part of his award, he received a free one year membership to NZART and a free membership to Branch05. He has been donated a HF radio, so he hopes to be on the air as soon as his license arrives.

Shown here in the picture: examiner Des ZL3AK, Oliver and his father David ZL2ARY. Very well done Oliver.

Kelvin Barnsdale ZL3KB

Examiner Des ZL3AK, Oliver and his father David.

Aerial building activities for students in the park.

For more Radio Tek photos please see inside back cover.

Digital Modes

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ROS Spread Spectrum

I have avoided talking about this mode previously because I have reservations about the design, and its use on the busier HF bands. It's an example of designing something 'because we can', rather than to solve a particular problem, having taken all the technical factors involved into account. The latest version also suffers from feature overload.

ROS surfaced about a year ago, and was described initially by the designer as a Direct Sequence Spread Spectrum (DSSS) mode. The designer later withdrew this statement, leading to a large credibility gap[1]. DSSS is not permitted on HF in some countries, and in any case is not desirable on busy bands. In my opinion it is still DSSS, despite what the web site says to the contrary. The software, now up to version 6.4.6[2], is the work of José Alberto Nieto Ros, EA5HVK, and now includes CAT operation.

You will from time to time hear these very wide transmissions, especially on 30m and 20m. It can be difficult to tell them apart from other wide modes, especially Olivia. These transmissions cause considerable disruption to other services if used inappropriately, and despite it being 'a cool thing to try', I urge you to limit your experimentation to bands where there is plenty of room.

ROS has three speeds, which can be auto-detected, but does need a fast computer. Have a play with the software; it is very interesting, and the performance is quite remarkable, quite good typing speed, very sensitive and very robust. The software is very clunky, and not at all user friendly, there is no useful help file, and making a QSO isn't easy, although I admit it is quite cool to see the meters climb up when it (finally) recognises a signal. You have to wonder why DSSS was used, since if a Walsh-Hadamard (deterministic rather than random) spreading technique were used, a similar result would be achieved without the SS label; but that sounds like Olivia, and we already have that!

DSSS

Direct Sequence Spread Spectrum (DSSS), in this case using MFSK modulation, takes coded data similar to MFSK16, and multiplies it by a pseudo-random number (PN) sequence, which generates more information, requiring more tones for transmission. In this case what might start as a 16FSK transmission is spread out into a 144FSK transmission (still at 16 baud), the whole signal occupying a bandwidth of 2250Hz. The receiving station processes the spread-out data using the same sequence, which (provided the sequence is correct and the sequence phasing is correct) results in a de-spread data stream which can then be decoded.

The SS signal is spread over a wide bandwidth, so the average power at any frequency is reduced. At a first glance, there seems to be no advantage to spreading the signal out, only to pull it back in later, wasting bandwidth and adding complexity. However, when it comes to interference effects (for example partial signal loss within the bandwidth due to selective fading, loss due to carriers and other interfering signals, multi-path distortions), a useful advantage comes from the fact that when the received signal is de-spread, the interference effects not related to the signal are in turn spread out, so their energy becomes low compared with the recovered signal. You end up with a net gain in performance. Also, by spreading the signal over a wide bandwidth, the effects of poor tuning, drift, and Doppler (induced by the ionosphere) are much reduced.

Other Spread Spectrum Modes

There are several types of Spread Spectrum techniques in addition to DSSS (as described above). Frequency Hopping (FHSS), where multiple symbols are transmitted on each of several frequencies, is generally used only to prevent transmissions being intercepted and to avoid jamming, and not appropriate on Amateur bands. Another type involves time hopping, although random time hopping can also be used to randomize collisions between transmissions (this technique is used by WSPR). A common form of DSSS uses a PSK data stream with different codes inserted in the data stream for different stations, and we use this type every day in GPS and in CDMA cellular phones.

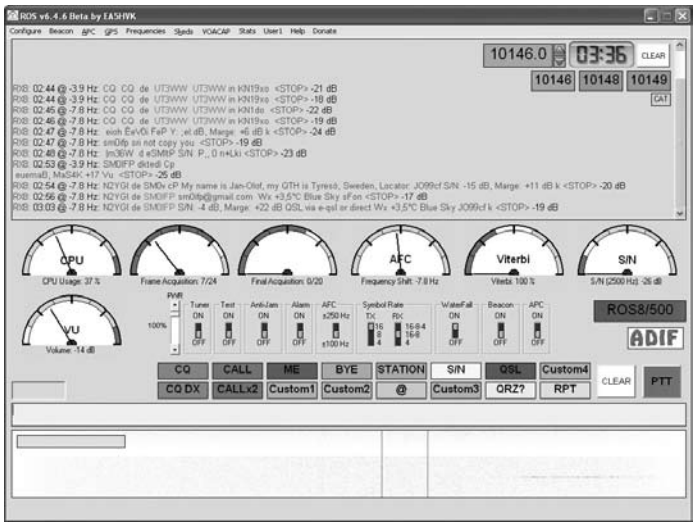

Figure 1. Screenshot of ROS operating on 30m.

Let's look at some other Amateur modes that use spreading codes. Are they also Spread Spectrum? Are modes that use other spreading techniques also Spread Spectrum? Here are some examples:

1. CMSK[3] (designed for LF/MF) is narrow-band and uses a short PN-sequence time-multiplexed with the data to allow frame timing to be determined via cross-correlation even when the signal is very weak. It is not spread-spectrum.
2. WSPR[4] uses a PN sequence to determine frame timing, which also doubles the number of bits to be transmitted. While technically it could be considered a DSSS mode, the spreading is in time of transmission, rather than bandwidth, as the signal is only 5Hz wide. As mentioned earlier, WSPR also uses time hopping.
3. MT63[5] and Olivia[6] spread the data in the frequency domain by multiplying not with a random sequence, but with a Walsh-Hadamard transform. While the bandwidth is increased by a large factor, these are not spread-spectrum modes.
4. DominoEX[7] and THOR[8] use a rotating modulation sequence, where the frequency of each symbol depends on the data to be transmitted, the previous data transmitted, and a fixed additional rotation number. While the bandwidth is thereby increased slightly, the result is deterministic, and these are not Spread Spectrum modes.
5. The little-used Chip64 mode[9] uses a series of four gold codes (PN sequences which have low mutual cross-correlation) to send data two bits at a time. While it is technically a Code Spreading SS mode, the bandwidth is modest. This mode was designed to provide good multi-path performance without exceeding the FCC 300 baud limit for HF data modes.
6. PSKSounder[10], developed by ZL2AFP for making ionospheric soundings on HF, uses a data frame with a PN sequence to define the timing. While very broad due to the high baud rate (2000 baud), it is not Spread Spectrum.

Writing your own Windows Programs

For more years than I care to remember, I've been writing programs for radio applications using the old and really reliable Microsoft Quick Basic® 4.5 compiler. There wasn't much I couldn't do, but as operating systems progress, DOS programs have been increasingly painted into a corner, and now,

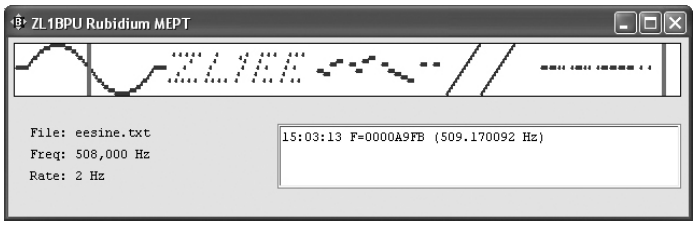

Figure 2. Screenshot of Windows MEPT Controller.

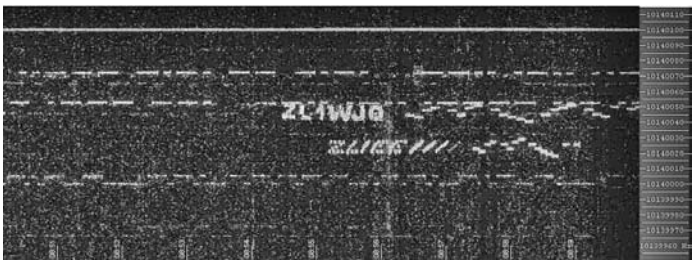

Figure 3. ZL1WJQ received at VK7ZL.

while the compiler will still run, the executables it creates are not compatible with Windows in a number of respects: graphics support, memory use, multi-tasking, and most of all I/O resources.

Con ZL2AFP is a real expert with Power Basic®, which is a commercial Windows compiler system, and can do just about anything we can dream up which uses graphics, serial communications and sound card data. I looked at Power Basic and decided that with my small brain and number of remaining years, I needed something with a shorter learning curve and smaller budget requirement.

I have recently been exploring Just Basic®, which is a freebie version of Liberty Basic®. While there are significant limitations (it uses tokenised files, not true compiled EXEs), and has some very weird bugs and even weirder syntax, JB has the advantage that it is really good at serial communications, works happily within even Windows 7®, and can do quite good graphics as well as mixed text and graphics. The learning period is reasonably short as there are plenty of good examples.

Here is an example of one of my programs; it is a serial controller for the FEI Rubidium Synthesisers, which allows them to be used as LF/MF/HF MEPT signal generators. The program creates a quite complex but very flexible multi-mode transmitted pattern, which can nevertheless be described in a simple text file. The program actually shows the transmitted pattern on the screen and uses a pointer to show where in the pattern the transmission is.

The question of which Windows BASIC to use is by no means finally answered. There are dozens of alternatives out there. I'm looking for one that is easy to use, has excellent graphics and serial communications, and will compile to a stand-alone executable. Ideally it will also have simple sound card support and be free. Next on my review list is XBLite, which is free and open source[12]. How about you tell me of your experiences with Windows and BASIC in a radio environment?

Stand-alone MEPT

In the last column I mentioned development of a new idea for a stand-alone MEPT controller using an embedded Linux platform. Well, Andrew ZL1WJQ has now had the prototype on the air. It uses a recycled network attached storage device (NAS), which has a network connection, serial port, and a USB port. With a simple program he has developed, a USB sound 'dongle' and an MP3 sound image to transmit, Andrew has a nice compact low power MEPT operating. While it's only been on the air on 30m briefly, it's been widely received.

It goes to show that the ears are everywhere – even a brief appearance on 30m, and ZL1WJQ has been 'grabbed' all over the world!

Figure 5 is a good example of image 'stacking'; averaging multiple images to enhance signals which have the same repeat period as the sample time of the grabber. ZL1EE is the pioneer of accurate 10 minute MEPT transmission periods, and here you see both of us glowing nicely with the noise reduced, while the other signals show no discernable pattern.

Just recently Mauro IK1WVQ sent me a single frame grab of my signal on 30m with three of the diagonal stripes visible, the weakest stripe was transmitted at only 8mW!

Final Finals

I've just read that Prof Robert Helliwell of Stanford University died recently. He was known for his work on the physics of VLF propagation, and is remembered for his excellent book 'Whistlers and Related Ionospheric Phenomena'[13].

References

[1] <http://www.arrl.org/news/fcc-reaffirms-statement-on-ros>

[2] Download from <http://rosmodem.wordpress.com/>

[3] <http://www.qsl.net/zl1bpu/CMSK/cmsk.htm>

[4] <http://www.physics.princeton.edu/pulsar/K1JT/wspr.html>

[5] <http://www.w1hkj.com/FldigiHelp-3.20/Modes/MT63desc.htm>

[6] <http://hflink.com/olivia/>

[7] <http://www.w1hkj.com/FldigiHelp-3.20/Modes/DominoEXdesc.htm>

[8] <http://www.w1hkj.com/FldigiHelp-3.20/Modes/THORdesc.htm>

[9] <xoomer.virgilio.it/aporcino/Chip64/Chip64_description.pdf>

[10] <http://www.qsl.net/zl1bpu/SOFT/PSKSounder.htm>

[11] <http://www.powerbasic.com/>

[12] <www.xblite.com/>

[13] Stanford University Press, 1965. It is still in print (Dover Publications, 2006).

Next deadline for copy is **10 July**

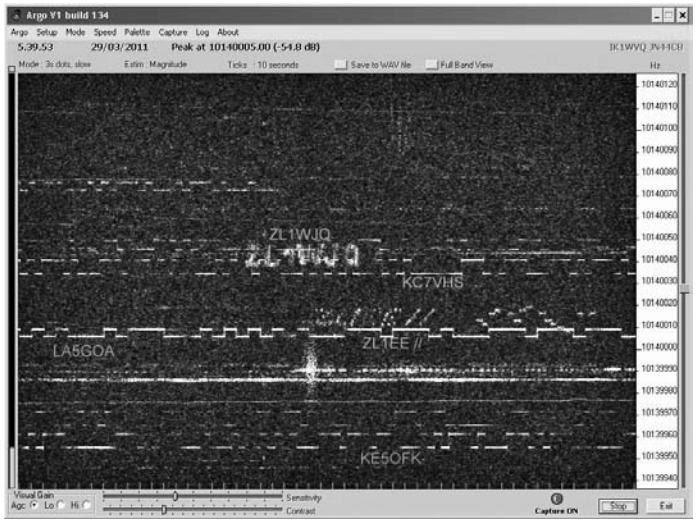

Figure 4. ZL1EE and ZL1WJQ received by IK1WVQ.

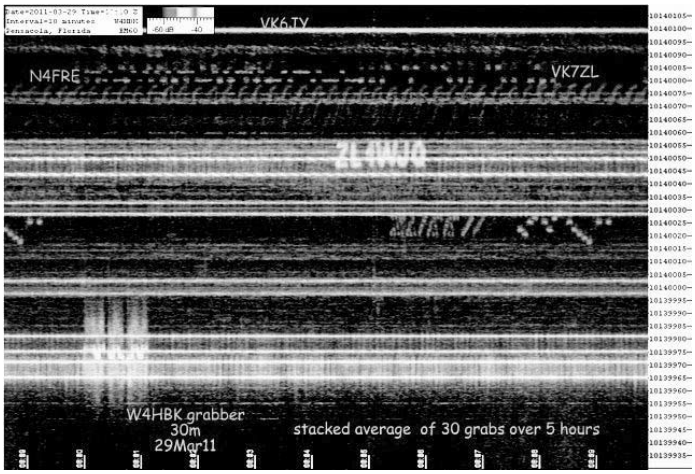

Figure 5. W4HBK 'stack' image with ZL1WJQ and ZL1EE visible.

Longer Wavelengths

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More Software Defined Radio

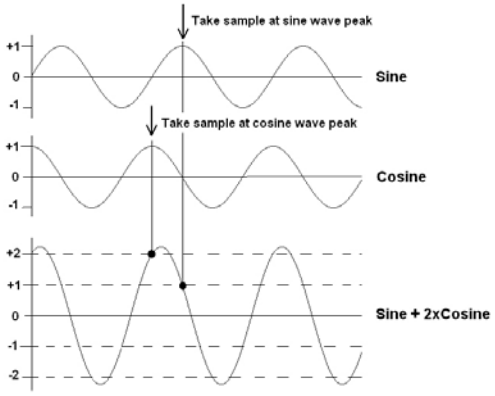
Perhaps the simplest way to receive LF/MF is to use a converter and the ordinary shack receiver. Some years ago Fred Johnson ZL2AMJ published a constructional article for a simple LF converter using an NE602 mixer[1]. This was intended to be used with the ALIVO direct conversion receiver, but of course it could be used with any suitable receiver. The ALIVO receiver itself can also be modified to receive on LF/MF, but it will suffer from the inherent shortcomings of direct conversion receivers, the main one being the inability to suppress the other sideband and the 3dB increase in noise resulting from reception of these "unwanted" sidebands. For LF/MF reception a 3dB increase in noise level is often enough to bury a signal, as we are dealing largely with weak signals close to, or more often than not beneath, the natural noise floor.

An equally simple, but far more powerful, LF/MF receiving system can be made using the Software Defined Radio (SDR) concept. This uses a simple quadrature sampling mixer to convert the RF signal to baseband audio where it is then processed with a soundcard and computer. Most of the hard work is done by the computer via suitable software. Within a software environment you can implement a wide range of Digital Signal Processing (DSP) functions such as noise reduction, noise blanking, bandpass and band reject filtering, etc. Tuning is accomplished via a numerically controlled local oscillator (ie a software oscillator, NCO), and up to 96kHz (or more) of the band can be displayed on the computer screen as a panoramic receiver. If you write your own software, then it is no exaggeration to say that "the sky is the limit" in what you can do.

The way an SDR eliminates the unwanted sideband is through Quadrature Mixing or Quadrature Sampling Detection (QSD). This involves mixing the incoming signal with two local oscillator signals at the same frequency but 90 degrees out of phase with each other. A direct conversion receiver uses only one local oscillator (LO) which mixes with the RF signals above and below the LO frequency to produce an audio output that contains both upper and lower signals. With no way of separating them, this immediately increases the noise floor by a factor of two (3dB), not to mention the interference from unwanted signals. However, by using two LO signals (a sine wave and a cosine wave) it is possible to separate the upper from the lower sidebands.

To illustrate the principle of quadrature sampling detection (QSD). Figure 1 shows a signal consisting of a steady sine wave plus a cosine wave of twice the amplitude, ie $y = sin(x) + 2\,x\,cos(x)$. This signal is sampled when the sine and cosine waves are exactly at their respective peaks. The value of the sample at those instants is exactly the value of the sine and cosine components of the signal at those instants, in this case 1 for the sine wave and 2 for the cosine wave. That this is evident can be seen from the fact that, when the sine wave is at its maximum, the cosine is zero, and when the cosine wave is at its maximum, the sine is zero. So a signal consisting of a sum of sines and cosines can always be separated out into its sine and cosine components. In fact all signals can be decomposed into a Fourier series of sine waves (remembering that a cosine is just a sine wave shifted in time (phase) by a quarter of a cycle, or 90 degrees). This is how the term "quadrature" arises; a quarter of a cycle. "Orthogonal" is another term that is used ("orthogonal" is a flash way of saying "right angle" ie 90 degrees) but the process is the same regardless of obscure terminology.

Of course this is just the phasing method of generating SSB, only in reverse. Whereas the phasing method requires careful phase and amplitude adjustments for sideband suppression, the QSD method provides local oscillator signals already exactly 90 degrees out of phase. As a result it is much easier to achieve good sideband suppression with a minimum of components and no fiddling with phase shift networks.



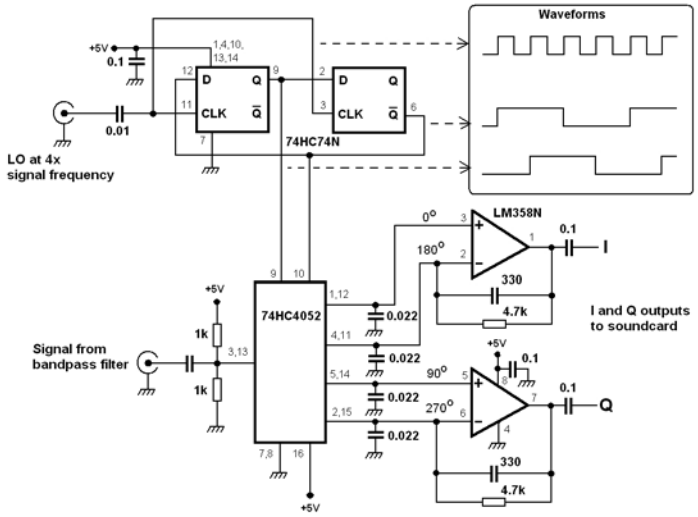
Having created in-phase (I) and quadrature (Q) outputs at audio frequencies (remember this is still just a direct conversion receiver) we then send these into the stereo line inputs of a soundcard, where the software does the rest. The processed audio comes out through the soundcard loudspeaker output. I have found that it is best to use a separate soundcard for audio input and output. The standard AC97 soundcard built into most computers tend to leak audio between input and output and you end up with the audio output showing up as an enormous input signal in the middle of the band. One of the many available USB soundcards will suffice. I use one that has a sample rate of 96 kHz. Using I and Q inputs to the SDR receiving software, an RF bandwidth of 96 kHz can be demodulated and displayed in its entirety.

Even though the audio input bandwidth of the soundcard is limited to 48 kHz by an anti-alias low pass filter, a bandwidth of twice this is possible because we can "unwrap" the upper and lower sidebands. The soundcard "sees" only 48 kHz of audio but this consists of 48 kHz of upper sideband (I) and 48 kHz of lower sideband (Q). One way of visualising this is that the two sidebands are "interleaved" within the same 48 kHz band. The sine and cosine sampling process "de-interleaves" them, where they can be stitched together to produce the full bandwidth of 96 kHz. This is indeed one of the few instances where there is a "free lunch".

I should note that the SDR program WRPlus that I had been using recently is no longer available for download. The author is turning it into a commercial product and existing versions that may be installed no longer work (unless you want to turn the computer clock back a few weeks!). However Winrad, from which WRPlus was derived, works just as well and is still available for download [2].

The circuit in figure 2 is perhaps the simplest ever QSD mixer front end. The components are readily available locally. The 5 volt supply can be pinched from the USB port, saving some cables. A local oscillator running at four times the signal frequency feeds a Johnson Counter that produces square "sine" and "cosine" signals at the signal frequency that alternately switch a 4052 multiplexer to produce the I and Q outputs. In this circuit sampling is done at 0, 90, 180, and 270 degrees rather than just 0 and 90 degrees as this gains us a 6dB signal increase. The 0 and 180 degree output signals are combined in a dual operational amplifier (LM358, NE5532 etc), as are the 90 and 270 degree outputs from the mixer.

This is a "sample-and-hold" mixer where the sampled waveform is stored in the 0.022 µF capacitors. The bandwidth is dependent upon the capacitance and the input resistance of the mixer, including the "on" resistance of the gates. Some experimentation for best results may be necessary. I built my mixer on a breadboard (remarkably, it works well in spite of wires heading off in all directions!).



The oscillator input to the 74HC74 configured as a Johnson Counter can be a crystal oscillator or a signal generator. You need at least 0.5V rms to get the 74HC74 to switch correctly. The circuit as shown functions well between 100kHz and 1MHz. At lower frequencies there is too much jitter in the 74HC74 when using a low level sine wave input and at higher frequencies the CD4052 that I used instead of the desirable 74HC4052 does not switch fast enough at only 5V supply. But it is good enough for the amateur LF and 600m allocations and with suitable bandpass filtering on the front end provides performance at least equal to, if not better than, a conventional receiver.

I must stress that front end filtering is essential to keep broadcast stations and aeronautical navigational non-directional beacons (NDB's) out of the input. I use a coil and variable capacitor from an old crystal set, with the coil and capacitor in series with a wire antenna (my G5RV with the feeders tied together). As this is a vertical E-field antenna, a decent RF earth is necessary to reduce QRM pickup. Better reception should be possible with an active antenna which can be located away from source of QRM.

Discussion of LF/MF matching with autotransformer or L match

Bob ZL2CA has been investigating antenna matching at LF/MF and has provided the following report on his findings.

"An inverted L antenna that fits a suburban section is always a large capacitive reactance at LF/MF. The resistive component depends on RF ground arrangements and it is the resistive component that should be matched to 50 Ohms to suit connection to a transmitter and filter designed for a 50 Ohm load. Basic choices for LF/MF matching are an L network or autotransformer.

L match

An L match is an application of series to parallel transformation for an inductor and capacitor. Higher resistance (step up) is always on the "parallel side" and lower resistance (step down) is always on the "series side". If you want step up rather than step down then the circuit "swaps around". A comparison of component values shows that "low pass" has lower values for L and C than for "high pass", consequently most L matches use the low pass configuration (series inductor and shunt capacitor).

Table 1 has L match values for antenna resistance of less than 50 Ohms. Table 2 caters for antenna resistance greater than 50 Ohms.

For an L match and when antenna resistance is less than 50 Ohms, the series inductance can conveniently be absorbed into the cold end of the main loading coil, so the L match simplifies to needing only a selected shunt capacitor. The tables show that the range of shunt capacitance is about 2 to 70 nF, which can be satisfied with fixed capacitors in parallel. If the antenna resistance is "unknown" but the SWR is able to be minimised by L network trial and error selection, then a good estimate of resistance can be deduced by calculation using the discovered L and C values (or approximated by interpolation from the table).

Autotransformer match

An RF autotransformer is usually provided by a fully wound toroidal core and wire scraped so that taps can be soldered. This gives a way of either "tapping down" or "tapping up" to match antenna resistance. A perfect transformer would behave as "turns squared". Measurements on an autotransformer that has been successfully used for many years on LF, and more recently on MF, found an unexpected result that connecting test resistors resulted in higher than expected SWR within the autotransformer itself, but it worked well for matching an actual antenna (an inverted L with variometer tuning). The toroid core is QRO capable, being a high frequency iron dust toroid with 60 mm OD and 30 mm wide. A full single layer winding of 62 turns has an inductance of 665 µH. A 14 position rotary switch goes to taps for nominal 2.5 Ohm steps below

continued on page 24

Table 1 L matching 5 to 45 Ohms (series to parallel transformation)

Series R	For 136 kHz	For 180 kHz	For 505 kHz
5	17.6 µH, 70.3 nF	13.3 µH, 53.1 nF	4.7 µH, 18.9 nF
10	23.4 µH, 46.8 nF	17.7 µH, 35.4 nF	6.3 µH, 12.6 nF
15	26.8 µH, 35.8 nF	20.3 µH, 27.0 nF	7.2 µH, 9.6 nF
20	28.7 µH, 28.7 nF	21.7 µH, 21.7 nF	7.7 µH, 7.7 nF
25	29.3 µH, 23.4 nF	22.1 µH, 17.7 nF	7.9 µH, 6.3nF
30	28.7 µH, 19.1 nF	21.7 µH, 14.4 nF	7.7 µH, 5.1 nF
35	26.8 µH, 15.3 nF	20.3 µH, 11.6 nF	7.2 µH, 4.1 nF
40	23.4 µH, 11.7 nF	17.7 µH, 8.8 nF	6.3 µH, 3.2 nF
45	17.7 µH, 7.8 nF	13.3 µH, 5.9 nF	4.7 µH, 2.1 nF

Table 2 L matching 60 to 200 Ohms (parallel to series transformation)

Parallel R	For 136 kHz	For 180 kHz	For 505 kHz
60	26.2 µH, 8.7 nF	19.8 µH, 6.6 nF	7.0 µH, 2.3 nF
70	37.0 µH, 10.6 nF	28.0 µH, 8.0 nF	10.0 µH, 2.8 nF
80	45.3 µH, 11.3 nF	34.2 µH, 8.6 nF	12.2 µH, 3.1 nF
90	52.3 µH, 11.6 nF	39.5 µH, 8.8 nF	14.1 µH, 3.1 nF
100	58.3 µH, 11.7 nF	44.2 µH, 8.8 nF	15.7 µH, 3.1 nF
150	82.7 µH, 11.0 nF	62.5 µH, 8.3 nF	22.3 µH, 3.0 nF
200	101.3 µH, 10.1 nF	76.6 µH, 7.7 nF	27.3 µH, 2.7 nF

Table 3 Single layer autotransformer matching to 15 or 22 Ohms

Resistance	For 136 kHz	For 180 kHz	For 500 kHz
15	52 + j51	52 + j73	52 + j164
22	52 + j30	53 + j40	52 + j90

continued from page 23

25 Ohms and nominal 5 Ohm steps from 25 to 50 Ohms.

Impedance tests were carried out with a 15 Ohm resistive load on the calculated 15 Ohm tap, and 22 Ohms on the calculated 22.5 Ohm tap. Table 3 summarises results.

The matching for the resistive component was "very good" but clearly there was significant arising inductance. Arising inductance gets worse as there are less turns tapped. While a toroid suits magnetic flux being concentrated in the core, there are still some air return flux paths and thus somewhat short of ideal 100% linkages for all turns. Not for the first time, departure from ideal transformer action is explained by leakage inductance. When the autotransformer is used with an actual antenna, adjusting the main tuning variometer for resonance happens to easily "soak up" the inherent inductance in the matching transformer, which is why a leakage inductance imperfection was not noticed over many years of use. Test results suggest the leakage inductance is equivalent to 5 to 10% of the full winding, which would be why deduced resistance ratio is still fairly close to "turns squared" results.

It is difficult to see how a better result could be obtained from what is a convenient arrangement of a single layer toroidal winding, directly tapped. Less leakage inductance could be obtained with a multi-filar winding, but the downside is being forced to use ratios like 4, 9, 16 and 25. It would be difficult to rewind a 62 turn core to instead be five parallel windings, with 12 turns per winding, and do all the start and end connections for correct phasing. It is concluded that the single layer tapped arrangement is the practical approach for LF/MF autotransformer matching, but the user should be aware it has leakage inductance that is conveniently compensated for by variometer main tuning."

Progress Report on an International Amateur Allocation at 500 kHz

Peter Lake ZL2AZ (Director IARU Region 3) has contributed the following report on progress towards an international allocation in the 600m band.

"Diligent readers of this column and the "IARU Column" will have noted reports from time to time about the ongoing efforts to achieve a small "world wide" allocation in the vicinity of 500 kHz – a so called "600 metre" band. This is a progress report covering late 2010 and early 2011.

Just to recap – at the World Radiocommunication Conference (WRC-07) in late 2007 the amateur service managed to get a "future agenda item" accepted for the then next WRC (WRC-11 at that time; now WRC-12 re-scheduled for January/February 2012 in Geneva). Our interest is "Agenda item 1.23: *To consider an allocation of about 15 kHz in parts of the band 415 – 526.5 kHz to the amateur service on a secondary basis, taking into account the need to protect existing services*". This new item was strongly supported by the NZ administration (the MED) and others at WRC-07 in the face of some opposition.

The frequency range proposed is currently allocated to the broadcasting, maritime mobile, aeronautical mobile, land mobile and aeronautical radionavigation services in various sub-bands. Not all users and administrations are convinced that amateurs can coexist and share with the incumbent services.

Work has progressed at international level, led by the IARU technical and regulatory experts, and supported by other expert amateurs in each of the three IARU/ITU regions. Ongoing and detailed work to build support has to be done in Region 3 (Asia – Pacific) and in each country.

Most recently in Region 3 the "4th APT Conference Preparatory Group" (APG) meeting (APG2012-4) was convened by the Asia Pacific Telecommunity (APT) and held in Hong Kong, China from 13 – 18 December 2010. The APG meetings are attended by most of the administrations and radio regulators in the region, and some "observers" such as IARU Region 3. The APG2012-4 meeting was attended by more than 370 people. The meetings attempt to reach consensus agreement on each of the more than 30 agenda items through a number of drafting groups and working parties. Only the administrations have "votes". "Regional" agreements are now being made in advance of the WRC, in an attempt to streamline the WRC meetings – when over 3,000 delegates are present. Attendance at these regional meetings is vital to success.

Directors Peter Lake ZL2AZ and Shizuo Endo JE1MUI attended representing IARU Region 3, submitting an information document and giving a presentation to the Opening Plenary. Supportive inputs were given by the administrations of NZ, Australia, Japan, Korea and Malaysia. Some administrations did not provide inputs.

Four different "Methods" to satisfy the agenda item were originally identified to try and narrow the original broad spectrum request. Detailed studies were done by the IARU to find small slices of the band with the least use – especially by aeronautical non directional beacons (NDBs) and maritime mobile NAVTEX transmissions. Bob ZL2CA has covered these in detail in earlier columns.

Methods A, B, C, and D have been developed progressively by an ITU "Conference Preparatory Group" (CPG) resulting in a "Draft CPM Report". The Conference Preparatory Meeting technical group is tasked with providing this report to guide administrators and regulators at WRC-12 (for all agenda items).

In summary, the methods are:

- *Method A* – One worldwide secondary allocation of about 15 kHz in the range 493 kHz to 510 kHz
- *Method B* – One worldwide secondary allocation of about 15 kHz in the range 472 kHz to 487 kHz
- *Method C* – Two non-contiguous worldwide secondary allocations at 461–469 kHz and 471–478 Hz, totalling about 15 kHz
- *Method D* – No change (NOC) – that is, no allocation would be approved.

To cut a long story short, the APG2012-4 meeting decided by a small majority to prefer Methods B and C, with some qualifications about sharing and protection measures for the existing services. Iran and China were not convinced that any sharing was possible (thus favouring Method D). Considerable discussions occurred in the drafting group meetings and some "education" was needed to correct some misunderstandings and incorrect interpretation of the "sharing studies" done by the IARU experts. More work is needed to build more support and better understanding. Method A was not now considered to be an option by the APT. It was judged to be better to declare this now to avoid ongoing distraction. France and some others are proposing in another agenda item (1.10) to re-use 495 – 505 kHz for a "port safety and security" system. It was clear that the amateurs would not win this allocation and it was better not to have an ongoing direct argument. Many of us would have intuitively favoured this "historical" part of the band. However, below 500 kHz has some technical advantages.

Only one more meeting now remains in the Region 3 cycle of work before WRC-12 is held in early 2012. This APG2012-5 meeting is scheduled for late July/early August 2011 in Busan, Korea. We need to get more support to lock in our position at the APT. Key "outputs" from the 4th meeting are for the administrations at the 5th and final meeting to submit a preferred Method. They are also requested to provide frequency and geographical location information on the current status of maritime and aeronautical NDB usage in their countries (in the allocations being considered in Methods B and C). These requirements are to focus their attention and prevent "general" objections continuing to block progress.

Following after the APG-4 meeting, in February 2011, another (and final) meeting of the ITU "Conference Preparatory Group" (CPG-2) was held in Geneva to finalise their draft report. The outcomes for agenda item 1.23 in their "Final Report" (totalling more than 500 pages!) were to recommend Methods B and C (as above). The CPG also recognised the extreme difficulty of continuing with Method A. Consequently

FMTAG – Frequency Management and Technical Advisory Group

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FMTAG at VHF Convention 2011

FMTAG was invited to attend the Forum session (Sunday 24 April) of VHF Convention at Easter 2011. Many interesting topics were discussed, under the Chairmanship of John, ZL2HD.

However, the only matter directly involving FMTAG was a request for inclusion in the VHF/UHF/SHF Bandplans of a Simplex Calling Frequency for the P25 Digital mode, which was the subject of a detailed presentation by John, ZL4JY, on the previous day.

During the Forum discussion various frequencies were suggested, but subsequent investigation since VHF Convention, in accordance with PIB38, has shown that none of the suggested frequencies are suitable for universal, nation-wide, use.

At its July 2008 meeting, NZART Council approved addition of the following Calling Frequency to the bandplan:

F+0.550: Narrow digital mode simplex of up to 16 kHz bandwidth

In other words: 144.550 MHz, 432.550 MHz, 925.550 MHz, 1296.550 MHz, and so on. This is included in the bandplan shown on page 7-16 of the current *Call Book*. These frequencies are suitable for universal, nation-wide, use by D-STAR, P25 and other similar narrow band digital modes.

Proposals

That D-STAR, P25 and other similar narrow band digital modes be added, as an explanatory footnote, to the existing Calling Frequency in the Bandplan on page 7-16 of the current Call Book:

F+0.550: Narrow digital mode simplex of up to 16 kHz bandwidth (including D-STAR, P25 and other similar narrow band digital modes)

Branch 63 Upper Hutt has applied to add the D-STAR DV digital mode to, and change the location of, its Mount Climie 860 repeater. The new location will be Topo50 map reference BP32 798.83 423.94. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that the repeater's transmit frequency can remain on 438.600 MHz and the receive frequency can remain on 433.600 MHz, and that there will be no interference to other stations.

Branch 74 Wellington VHF has applied to increase the power of, and add the P25 digital mode to its 6625 repeater located at Hawkins Hill, Topo50 map reference BQ31 449.78 236.89. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that the repeater's transmit frequency can remain on 146.625 MHz and the receive frequency can remain on 146.025 MHz, and that there will be no interference to other stations.

Branch 74 Wellington VHF has applied for a 32 cm repeater located at Colonial Knob, Topo50 map reference BP31 513.58 426.16. FMTAG has chosen a repeater transmit frequency of 927.800 MHz and a receive frequency of 921.200 MHz. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that there will be no interference to other stations.

Branch 74 Wellington VHF has applied for a 6 m repeater located at Colonial Knob, Topo50 map reference BP31 513.58 426.16. FMTAG has chosen a repeater transmit frequency of 53.750 MHz and a receive frequency of 52.750 MHz. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that there will be no interference to other stations.

Branch 85 Mercury Bay has applied for a National System repeater located at Opito Bay, Topo50 map reference BA35 513.81 313.73. FMTAG has chosen a repeater transmit frequency of 434.800 MHz and a receive frequency of 439.800 MHz. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that there will be no interference to other stations.

Branch 85 Mercury Bay has applied for a National System UHF Linking Station (ULS) located at Opito Bay, Topo50 map reference BA35 513.81 313.73, to link to Mt Edgecumbe. The link transmit frequency will be 434.975 MHz and the receive frequency will be 439.975 MHz. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that there will be no interference to other stations.

Final Recommendations to NZART Council

Branch 60 Taupo has applied for a 2m APRS Digipeater at Kururau Road, Topo50 map reference BH33 913938. The transmit and receive frequency will be 144.575 MHz. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that there will be no interference to other stations.

Branch 74 Wellington VHF has applied to increase the power of, and add the P25 digital mode to, its Colonial Knob 7075 Voice and Data 2m repeater, located at Topo50 map reference BP31 513.49 426.17. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that the repeater's transmit frequency can remain on 147.075 MHz and the receive frequency can remain on 147.675 MHz, and that there will be no interference to other stations.

Branch 81 Waikato VHF has applied for a 2m Voice Repeater at Maungakawa, Topo50 map reference BC34 119.91 565.00. The transmit frequency will be 145.575 MHz and the receive frequency will be 144.975 MHz. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that there will be no interference to other stations.

Branch 81 Waikato VHF has applied for a 70 cm Link at Maungakawa, Topo50 map reference BC34 119.91 565.00. The transmit and receive frequency will be 434.350 MHz. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that there will be no interference to other stations.

Branch 81 Waikato VHF has applied for a 70 cm Link at Te Uku, Topo50 map reference BD32 732.64 067.29. The transmit and receive frequency will be 434.350 MHz. An Engineering Evaluation, in accordance with the MED's Radio Licence Certification Rules (PIB38), shows that there will be no interference to other stations.

Comments and Applications

Please send your comments and suggestions on the above matters, and on any other FMTAG matters, by e-mail to: <mtag@nzart.org.nz>.

Applications for repeaters, beacons, digipeaters, point-to-point links, and so on, should be made on the latest version of FMTAG Form 10. The latest versions of FMTAG Form 10, and the explanatory Form 10A, are available on the NZART website: <http://www.nzart.org.nz/fmtag/index.html>.

Completed forms should be sent by e-mail to <fmtag@nzart.org.nz>.

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it was deleted and the remaining Methods "re-numbered" A to C just to add some confusion. Helpfully, the drafting group chairman was Ken Pulfer VE6PF.

The "good news" is that the NZ position has been progressively developed and is aligned. It has also influenced the APG in Region 3, and the APG-4 view has been carried through to the ITU CPG and influenced them.

References

[1] "A Simple LF Converter", Fred Johnson ZL2AMJ, *Break-In,* January/February 1997, pp12-15

[2] <http://www.winrad.org>

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VHF Scene

Simon Watt-Wyness ZL1SWW
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Well, we are approaching the winter months. Now autumn, time to start thinking about those projects one has been putting off as the colder months give us no excuse for keeping out of the shack!

Constructional Projects

There has been the odd project going on at the scribe's QTH with the need for a power meter that can measure up to the high microwave bands. I stumbled on a rather nice article by Herbert DL5NEG who made up a good looking unit that just fits my needs. It is based on an Atmel AVR micro. He has two cuts of code, one for the AT90LS4433 (of which I had lying around) and the AT Mega 8. One stumbling block is that it is designed around a 16x4 LCD display that seems to be uncommon in ZL; 20x4 is much more prevalent. Anyway I set about modifying the C source code to give me a working system with a 20x4 display. What seemed a trivial task was made more complex due to memory constraints and some odd issues but now have a working system for the 20x4 display. For more info, please see <http://www.dl5neg.de/powermeter/powermeter.html> for more details, look for the key word 'rebuilding'..

On other constructional fronts, Steve ZL1TPH, is progressing with a new 10GHz transverter. This is a no tune design by Graham VK3XDK from Melbourne. He has developed a raft of "no tune" Transverters for 2.4, 3.4, 5.76 and 10.368 GHz. The 10 GHz system comprises as 9936MHz multiplier board and the TX / RX converter board good for 10mW or so.

Graham VK3XDK has also developed an Agile TCXO or GPS Lockable (10 MHz Reference) synthesised oscillator covering from below 1 GHz up to almost 2000 MHz, which makes for a nice local oscillator for the projects. These offer a good clean output with low phase noise. The PLL SYNTH boards use a SI4133G-bt chip as the PLL/VCO. The VCO is internal to the chip with an outboard inductor determining the operating frequency.

Six metres

Bob ZL1RS states that the 6m beacon for Penrhyn Atoll, North Cook Islands is now operational. Warwick E51WL has had this project on the boil for a while. Its call is E51WL/b on 50.048 CW. This system is running on a 28V solar panel system and running approximately 30W. It is currently running into a J-pole but Warwick wants to change that to a 5/8 vertical. Warwick has a very interesting perspective on 6m from his QTH. He gets many interesting indicators such as Asian and Russian TV as well as ZL signals coming in. Some of his QSOs during the March/April period include ZL3NW, ZL1RS, FK8, FO4BM, OA4TT in Peru, some into Brazil and Paraguay as well as K6QXY.

The band has had its openings through the February/ March/April months with indicators from JA, VK and contacts from ZL to E51, FK to name a few. JA and VK have been hearing ZLTV carriers at various intervals up to early April.

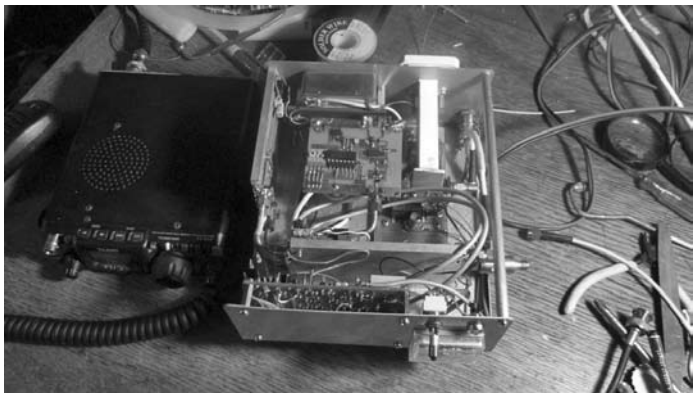
On 22 April during a short opening, Duncan ZL3JT heard JA4FM (S1) and worked JA6GGD (S5) both on CW, Rod ZL3NW also worked JA3EGE 5/9. Roger ZL3THQ was also hearing some of this activity. Kerry ZL2TPY also hearing VK TV carriers but nothing from JA.

2m and above

13 April, on a stable high pressure, Brian ZL1AVZ mentions that he worked Ray ZL2TAL in New Plymouth portable on 144 and 1296 as well as an attempt at 3400 MHz, from his QTH at Muriwai. Ray could hear Brian on 3400 but could not hear Ray's 50 mW into a loop Yagi. Propagation was good with Wellington 2m beacon at S7.

Low-band contest activity

Steve ZL1TPH makes mention of working from the home QTH with low activity. Stations he worked ZL1HI, ZL1AKW, ZL2IP plus also hearing some weak ZL2 stations turns out to be ZL2KBR (RF80KL) from Napier or Hastings, finally after knowing where to point, had a nice 5/5 contact.



Steve ZL1TPH's 10GHz Transverter.

Peter ZL4LV reports on some of his activities; "The 6m season finished here with a contact with VK3DUT on 3 February. I have had a few EME (moon bounce) contacts during January and February bringing my total now up to 94 at the time of writing this.

There has been no meteor scatter activity recently with Rex VK7MO being away and no one on from the north in ZL.

As many are aware Dunedin is not the ideal situation for long distance contacts being surrounded by hills particularly to the north. However during the VHF field day in December I copied ZL3THQ on 432 MHz working the field station of ZL4DK who was located on Swampy Summit. I gave him a call and he came straight back. It was quite surprising since I was only using about 30 W and the aerial was a junked commercial one resonant at about 460 MHz. I am at 200m altitude and the northern path is over Swampy Summit which is 800m.

The quiet time has not been wasted, I have been building two new 13 element Yagis for 2m EME use. They are now mounted on the tower and set for horizontal polarisation, the two 16 element Yagis that I have been using up to now have been remounted for vertical polarisation. I have no provision for elevation, however without this provision it is still possible to have an hour's operation time at moon rise or moon set. The new structure was erected at Easter and my thanks go to David ZL4DK for the help in the erection of the array.

As usual Murphy was around; prior to cranking up the tilt over tower, the SWR was checked on both vertical and horizontal aerials, all was as it should be. However when the tower was erected the SWR was very high on both aerials. Initially it seemed that either the coax was open or the aerial changeover relay which is in a box up the tower was not operating. Down came the tower again. David traced the problem to a sliver of steel, possibly swarf from some drilling, being located between the armature and pole piece of the aerial changeover relay. This prevented the relay from closing completely. Simple when found.

I have also mounted a camera on the mast to aid in sighting the moon when the sky is clear. I now await suitable EME conditions to check the improved aerial system."

VHF Convention 2011

Vaughan ZL1TGC reports on activities from the VHF convention. About 45 hams from Dunedin through to Auckland attended VHF Convention at Tawa College in Wellington over Easter weekend.

Hosted by the Wellington VHF Group, Branch 74, Convention started a little later than usual as it was preceded by the annual Wellington Radio Expo held on the Saturday morning. The opening keynote speaker turned into a quick brainstorming session on the features and benefits of amateur radio and how these could be used to interest non-amateurs in joining our hobby. This was conducted by Ross Pedder ZL2TUC and Phil Slater ZL2OWL who will be reporting on the results at some future time.

The first of a number of very good technical presentations followed: Leon Toorenburg ZL2AOC showed us an integrated GPS/camera/laser range finder called ikeGPS and how it was used. John Yaldwin ZL4JY told us all about APCO P25 digital communications and demonstrated how the digital voice sounded through the local 147.705MHz repeater, the first amateur radio P25 digital repeater in New Zealand.

The rest of Saturday afternoon was taken up with a mobile rally and operating contest. Organised by Don Wallace ZL2TLL and Lyn ZL2LKW assisted by Robert ZL2WAL and his wife Rachel, this was a fun event. We had to make a Yagi antenna out of some marshmallow men and wooden skewers, guess the ingredients of home-made Easter marshmallow egg; find two hidden transmitters as well as some on-air operating and answering questions about the rally route.

Saturday night's informal dinner was held at the Curry Village in Porirua, a short drive up the motorway from Tawa.

On Sunday the technical presentations continued. The Kiwisat team of Fred ZL1BYP, Ian ZL1AOX and Terry ZL2BAC brought us up to date on the status of our satellite. Hardware for the flight model is substantially complete and the last hurdle before seeking a launch date is to get the operating system software finished and tested. Terry ZL2BAC is developing telemetry decoder software for use by hams interested in monitoring the satellite's status. This will be available from AMSAT ZL by the time the satellite is launched.

Next, a presentation from John ZL4JY took a detailed look at the design considerations behind his company's Aprisa SR smart point-to-multipoint SCADA radio. The design uses a direct conversion receiver and John discussed the benefits and compromises required to achieve a product that would work well in a variety of world markets. Following on from ZL4JY, John ZL2HD brought us up to date with APRS (Automatic Position Reporting System) technology and looked at some new applications for this system.

UHF power amplifier secrets was the next topic. Doug ZL2TAR reported on his recent work linearising the operation of Mitsubishi MOSFET amplifier modules for use with digital TV. These modules are normally specified for use as a non-linear amplifier (Class C and D) but by carefully setting the bias current, the module can be used in linear mode. Doug's work is being published in *Q-Bit,* the Wellington VHF Group's newsletter.

A surprise addition to the programme was a short presentation by Murray Hely ZL3MH on the earthquake damage in Christchurch. Murray's work involves maintenance and repair of the underground electrical cable distribution network and his photos of the damage to sub-stations, cable repairs and houses in the Christchurch suburbs made for a very interesting talk.

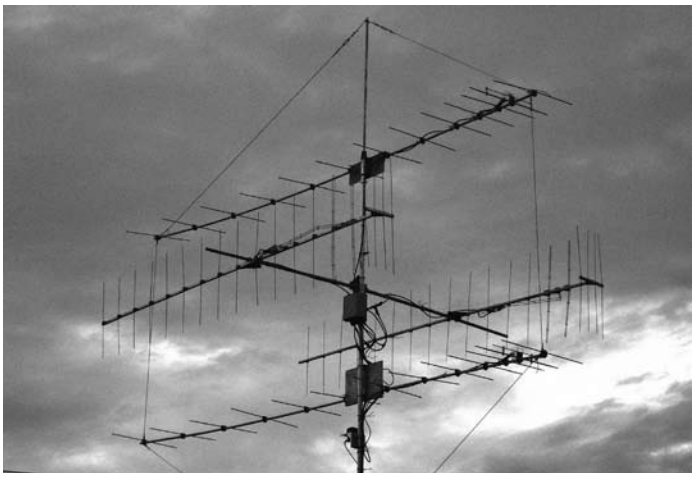
After lunch, Peter Cobb ZL3TC produced some kits of components and invited us to design and build a VHF oscillator powered from a 3V battery supply. More components were supplied than were actually needed, and a suitable circuit was provided for the less experienced constructors. Several took up the challenge but none of the finished designs showed any sign of oscillation! Next Con ZL2AFP showed us some of the work he's doing on narrow-band weak signal digital communications on the lower HF bands. He also showed some recent work on very slow scan (narrow bandwidth) colour digital TV.

The final session for the day was the VHF Forum conducted by John ZL2HD. Future of the National System was discussed. The Kordia lease agreement, access rights to land at key National System sites and the Egmont site is likely to be maintained by the Wellington VHF Group and investigations into an alternative site adjacent to Blue Duck were all discussed. The role of ARTANZ and fund raising options were also considered. Fees for Repeater and Beacon licences: it was noted that these are likely to go up in the near future. Fees could triple or more. The cost represents the MED's cost for responding to interference claims. The cost of administering the amateur service GURL is currently being met by the Crown.

CTCSS on repeaters: This has become more and more necessary as we experience interference from so called low interference potential devices (LIPD's). If you are planning on implementing CTCSS on a repeater, please let Warren ZL2AJ know; he is maintaining a master list and will also ensure that the information in *Call-Book* is updated. Currently 123Hz is favoured in Wellington; Auckland repeaters are using 88.5Hz.

VHF/UHF records: Simon ZL4PLM is taking over the administration of these records. Currently his proposals for changes are being reviewed by NZART Council.

Contests: A request for a bonus for single operator stations, request for more activity on the VHF/UHF contests and better publicity. Doug ZL2TAR, the Contest Manager will initiate consultation with the amateur contest groups on a change to the rules to allow a bonus for single operator stations. Final topic was a request for a simplex frequency for APCO P25 digital communications. Options discussed were for an allocation at 147.5MHz (existing simplex frequency identified for data use) or an alternative at 147.45MHz. This will be taken under action by FMTAG.



Peter ZL4LV's EME array.

Venue for Technology Convention in 2013 will be Auckland, hosted by the Auckland VHF Group, Branch 66. Thanks to the Wellington VHF Group for organising another enjoyable Convention.

Sunday evening dinner was the traditional fish'n'chips meal at the venue. Don ZL2TLL announced the results of the mobile rally, operating contest, and competitions. All but one team found both of the hidden transmitters. The ZL1TGC team's marshmallow Yagi was judged best design. Overall winner of the rally and competition was the ZL4JY team with a score of 84%.

2011 VHF-UHF-SHF Contest Calendar

Hibernation Contest. All bands 50 MHz and up. Saturday 11 and Sunday 12 June. This is the weekend after NZART Conference.

Brass Monkey Contest. All bands 50 MHz and up. Saturday 6 and Sunday 7 August.

Microwave Contest. All bands 614 MHz and up. Saturday 1 and Sunday 2 October.

Field Day Contest. All bands 50 MHz and up. Saturday 3 and Sunday 4 December.

For all contests, the operating periods are 1700 to 2300 on the Saturday, and 0700 to 1300 on the Sunday, NZ local time. The complete Contest Rules are available at: <http://www.vhf.org.nz/pubs/Contests/VHF-UHF-SHF-ContestRules>.

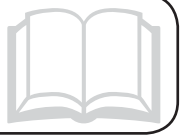
Summary

Acknowledgement to Bob ZL3TY, Rod ZL3NW, Bob ZL1RS, Warwick E51WL, ZL1TGC and others for assistance and input with 6m band news.

If you have input and pictures for the columns ahead; such as DX activity reports, repeater installation, branch activities, snippets of interest, technical items etc, please send to Simon ZL1SWW <zl1sww@nzart.org.nz> or *Call-Book* addresses. (We also accept large picture files sent via email).

Magazine Survey

Compiled by Grahame Fraser ZL3SJ
<grahame.fraser@canterbury.ac.nz>



Amateur Radio (WIA)
January & February 2011

p.6 A polarity protection circuit using a power FET.
p.7 An introduction to antenna modelling (using free demo version of EZNEC).
p.14 Contesting for beginners.
p.26 Unwanted mast/antenna interaction and the potential effects on performance (including guy wire resonance).
p.36 A combined capacitance meter and spot frequency generator.
p.48 A safer antenna mast from an old war machine design (trebuchet).
p.52 A non-kinky slinky antenna–with a 1:1 balun.

March 2011

p.12 How to aim an antenna with the internet and the sun.
p.14 Across the Tasman on 2.4 GHz.
p.19 An adaptable antenna for portable operation.
p.27 Delta loops and Quad loops and inverted vee dipoles.

April 2011

p.6 A transceiver for 137 kHz.
p.21 A car portable antenna mast.

May 2011

p.6 Foundation Corner 15 – Nostalgia or better engineering? Making and using parallel line.
p.9 An introduction to stepper motors.

CQ
January 2011

p.52 ESD Considerations and Protection Methods.
p.68 Tools for Kit-Builders.
p.76 The Benefits of Stainless-Steel Hardware.

February 2011

p.13 High-Frequency Transceivers (Brief survey of models from 12 manufacturers).
p.44 Protecting Capacitors in Series.
p.54 QRZ? Using a Propagation Prediction Program (ACE-HF Pro, US$99).
p.62 Interfacing with the Outside World.

March 2011

p.33 Math's notes (latching relays and delayed turn-off circuits).
p.54 Kit-building: Soldering Iron Tips.
p.60 Antennas: More on Ground Radials plus Log Periodics.

April 2011

p.50 Math's Notes: Recovering Signals from Noise (N.B. April issue).
p.60 The Birth and Early Days of Amateur Radio.
p.82 ISS Packet.
p.86 Receivers in the Shack plus Restoring Boatanchor Receivers.

QST
February 2011

p.34 A Portable 2 Meter Yagi (elements store inside boom).
p.37 A Compact 40 Meter Receiver (with 4.9 MHz crystal filter).
p.41 Building a Modern Signal Tracer.
p.44 Making Better Homebrew Traps from Coax.
p.49 Selecting the Best Coax for Your Next Antenna.
p.50 A Flexible Audio Limiter Using a Shunt Diode String.
p.52 A Farmer-Rancher's 2 kW HF Dummy Load.
p.54 Product Review: Ten-Tec R4020 Two Band CW QRP Transceiver.
p.64 Hands-On Radio #97 Programmable Frequency Reference.

March 2011 (Annual Antenna Issue)

p.30 A Four Wire Steerable V Beam for 10 through 40 Meters.
p.34 Digital VOX Sound Card Interface (no power, serial port or USB adapters required).
p.37 One Ham's Fix for Limited Space Antennas.
p.40 A Roof Mount for a Rotatable 160 Meter Receiving Loop.
p.42 A Factory Style Mobile Antenna Installation.
p.46 A Near End-Fed Antenna for Low Power 20 Meter Operation.
p.48 Using a Noise Bridge and Spectrum Scope to Adjust Your Antenna Tuner.
p.64 Getting on the Air: Get Ready for Sunspot Cycle 24.
p.67 Hands On Radio #98: Linear Supply Design.
p.71 Hang Gliding with Ham Radio.

April 2011

p.30 Nested Full Wave Delta Loops for 20 and 10 Meters.
p.33 The W7JI Low or Lower Power 40 Meter Transmitter (7.5 or 1.5 W).
p.38 Does Your Ground Radial Kit Measure Up? (16 tape-measure radials).
p.43 A Line Voltage Monitor for Your Shack (using wall warts and under/over voltage LEDs).
p.45 JT65 – The "Musical Mode".
p.57 Hands On Radio #99: Cascode Amplifier.
p.61 Canadian Club Digs PICAXE.
p.97 Microwave Construction Techniques.

May 2011

p.30 Supporting Portable Antennas Without Guy Wires.
p.33 A Transmitter for Fox Hunting (2 metre transmitter module and PIC microcontroller).
p.37 An Emergency Backup Solar Power System (330 W max, for shack and basic domestic load).
p.41 A Junk Box Power Line Frequency Monitor.
p.45 Product Review: Kenwood TS-590S HF and 6 Meter Transceiver.
p.52 A High Power RF Sampler (instead of using a high power attenuator).
p.58 Getting on the air: A Folded Skeleton Sleeve Dipole for 40 and 20 Meters.
p.61 Hands On Radio #100: A Hands-On Hundred (using components and transmission lines).
p.63 Using Multimode for iPad, iPhone and iPod Touch.

RadCom
January 2011

p.19 Homebrew: Transmit mixers and filters for the HF transceiver project.
p.26 Simple antenna for 13 cm.
p.32 Antennas: Modelling, measuring and more on loops.
p.39 Equipment Review: Kenwood TS-590S HF & 50MHz transceiver.
p.51 ATV: Rx & Tx frequency control with a PIC.
p.58 Getting started on 24GHz–final part.
p.66 Unsoldering SMD components.
p.72 Design Notes: A direct-from-audio I/Q upconverter.
p.79 Morse code examined using modern communication theory.

February 2011

p.19 Homebrew: Bandpass filters and low-level Tx amplifier stages for the HF transceiver project.
p.24 Design Notes: A new prototyping board; how to stop drift at microwave frequencies.
p.28 RF Sniffer (for sampling transmitter RF).
p.34 Start Here: Stacking and baying antennas.
p.51 GHz Bands: Seeing things in a different light (optical communications).
p.66 Simple antenna for 13cm–double your signal strength.

March 2011

p.19 Homebrew: Broadband linear HF power amplifier.
p. 32 Antennas: Multiband dipole antennas.
p.38 Software Radio in a Nutshell.
p.40 Design Notes: PLL synthesiser designs.
p.60 Extended quarter-wave vertical for 40m.
p.64 Adventures in optical communication – part 1.

April 2011

p.16 Adventures in optical communication – part 2 SSB via light.
p.20 A 50W PA for 70MHz handhelds.

Awards

Awards Manager: Alan Chapman ZL3GX
<awards@nzart.org.nz>

I have just had notification of a change of address for the Fiordland National Park Award. No change of requirement for the award.

Fiordland National Park Award

Requirements. Contact four separate stations/operators in, or within, one kilometre of the Fiordland National Park, plus two contacts with Branch 08 Members. Total of six contacts. Send log (no certifying required) with $5.00 to Branch 08, c/- PO Box 9, Wyndham 9849

Club Awards

Clubs running short-term awards or new awards should send details of the award to me via email or at my *Call Book* address or the address below. Remember that *Break-In* is only published on even months and copy, including, if possible, a copy of the certificate, for inclusion, should reach me by the end of the even month.

The Awards Net runs on 80m, 3.677 MHz every night from 0800 UTC every night of the year. Every one is welcome to join in especially if you are mobile and in a rare county or district.

To commemorate the 100th anniversary of the first transmission from Coast Radio Station ZLW on Wednesday 26 July 1911, the Wellington Amateur Radio Club is putting the commemorative call-sign ZM100ZLW on air from 26 July until 27 August 2011 and will be offering a special QSL card to all stations contacted. All amateur bands (MF/HF/VHF/UHF) will be used. It is also intended to use the 600m band and further details will be made available later.

NZART Awards Manager, PO Box 1733, Christchurch 8140 <awards@nzart.org.nz> or <www.nzart.org.nz/nzart/awards/#nzartawards>.

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p.24 Equipment Review: Icom IC-9100 HF to UHF transceiver.
p.27 Homebrew: More power amplifiers and the LPF unit.
p.34 Antennas: Shorted turn inductance tuning; loop antenna Faraday coupling loops.
p.38 Design Notes: More on programmable dividers.
p.52 Equipment Review: Flex-1500 HF – 6m software defined transceiver.
p.72 EMC: Switch mode power supplies.
p.77 Data Mode Identification.
p.81 Start Here: Getting started on VHF.

May 2011

p.15 Adventures in optical communication Part 3 – Beacons and an LED transceiver.
p.24 Homebrew: Receiver section of HF transceiver (and two-tone test oscillator).
p.34 Start Here: What could go in a log book?
p.38 Design Notes: Wide band down-converters for SDRs.
p.72 Antennas: Loop antennas again.

SPRAT
Winter 2010/2011

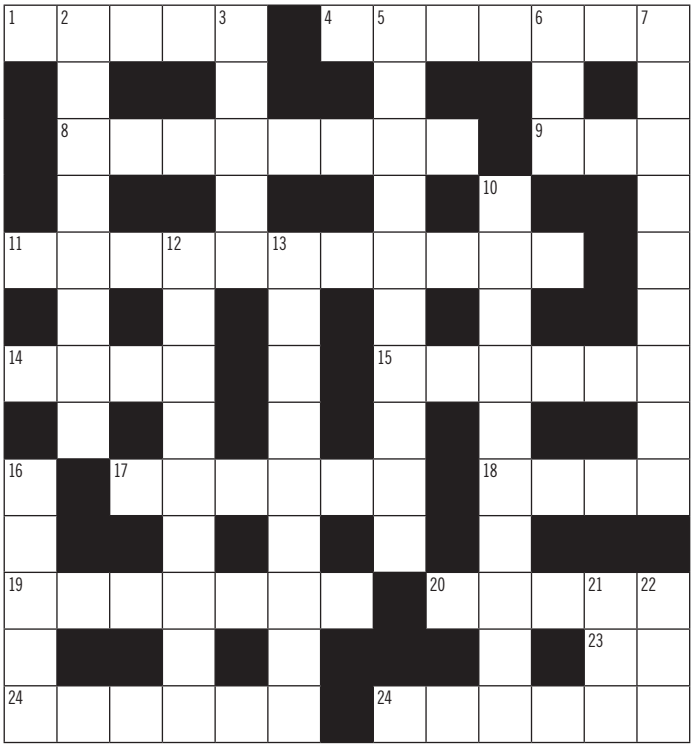
p.3 The "Easy Five" Receiver (Five transistors, five bands – 17, 20, 30, 40, 80m, regen).
p.8 The Morse Talker (Using verbal Morse to key a relay, for arthritis sufferers, etc).
p.13 Simple VLF Converter (using one BC547 as a crystal osc and mixer).
p.16 A Simple SSB Exciter/Receiver or From DC to Superhet.
p.27 BD139: the forgotten transistor? (6W on 7 MHz; fT of 180 MHz).

Spring 2011 (#146)

p.3 The ZL2BMI extra simple DSB 80m transceiver.
p.8 A Simple Yet Efficient Linear Amplifier.
p.11 A Graphical Aid for Measuring Inductance and Capacitance Using the MFJ-259B.
p.16 A Simple and Inexpensive Bipolar Transistor Tester.
p.20 A(nother) CW filter (variable bandwidth, variable centre frequency).

ZL Crossword No. 12

Compiled by Graeme Hunt ZL1ANH
email <graemeh@xtra.co.nz>



Across:

1. across and 7 down. Unit of inductance says this governor is not a ZL. (5, 9)
4. Particles in an atom (7)
8. Orientation of many antennas, particularly mobiles (8)
9. One form of ground for vertical antennas (3)
11. Series of calculations and graphs for antennas and transmission lines (5, 6)
14. Between high and ultra (4)
15. Peninsula including CT and EA (6)
17. When letter K is sent in a Morse transmission as an instruction, or perhaps an OH (6)
18. Most items at the junk sale have been (4)
19. Middle (7)
20. Capacitors and batteries do this with electricity (5)
23. Before NCEA and after School Certificate, (abbrev) (2)
24. Unintentional joining of wires, sometimes terminal (6)
25. Type of computer port (6)

Down:

2. Phonetic month (8)
3. PA and courage (5)
5. Couple of mythical beasties in a row (Maori place name) (10)
6. Ω (3)
7. See 1 across (9)
10. Reduces signal strength, your radio may have one in dB (10)
12. Also called a silicon controlled rectifier, SCR (9)
13. Baddies (9)
16. _____ and panels, old style radio set-ups (5)
21. Christian name of prophet from children of the mist (3)
22. Tuna is its Maori name (3)

Answers to puzzle on page 33

AREC – Amateaur Radio Emergency Communications

Geoff Gillman ZL3QR and Bev Gillman ZL3OV

AREC Mission Statement:
To be the preferred provider of Emergency Communications to New Zealand Emergency Services.

Hi everyone, as promised, here we have a special report on the February Earthquake and there will be further material in the next issue.

Christchurch Earthquake
AREC Christchurch response

Tuesday, 22 February

On Tuesday 22 February at 12.51pm Christchurch City was rocked by a violent shallow earthquake measuring 6.3 on the Richter scale.

After the earthquake struck, I went home to check on family welfare. After arriving and determining that immediate family and home were OK, Geoff Chapman (ZL3PX) called with the suggestion that we should attempt to retrieve the two AREC Emergency Communications Vehicles from the Branch 05 clubrooms located in Avonside; one of the more seriously affected areas.

The only now viable transport was bicycle, so with one borrowed bicycle (for Geoff) and my own, we made our way from Marshlands Rd area to the Br05 clubrooms. This trip was difficult with knee deep water, silt and holes (truck size) in the road to contend with. When we reached the clubrooms, we were able to get into the garage and get both vehicles. I proceeded to Dallington to check on the welfare of some elderly relatives, whilst Geoff started to return to his home.

Geoff made it across the Avon River, however by the time I had verified that the relatives were well, the bridges across the Avon River had been closed because of damage. We now had vehicles on each side of the river. While waiting with some of the relatives Don MacDonald (ZL3DMC) arrived as he also could no longer cross the Avon to return to his home in Kaiapoi.

We remained in contact with Geoff while he made contact with officials within CD (Wayne Rissman). Wayne required communications from the temporary welfare centre that had been established at Hagley Park. At Hagley the tent city that had been erected for the Ellerslie Flower show, had been taken over to act as an emergency welfare centre to cope with the large number of people displaced from the Central Business District (CBD) of Christchurch. Eventually over 600 people ended up in the Hagley Centre for the two days that it operated. As people began to make their way to Hagley, the weather changed for the worse and it began to rain steadily.

During this time, Steve (ZL2UCX) was called to respond with the Civil Defence and Red Cross teams undertaking Urban Search and Rescue in the CBD.

After Don and I arrived at Hagley, we found that CD had no communications from the site at all (unplanned venue). We deployed the Daihatsu on VHF (ESB41) and 2m (705 Repeater) and manned the site from around 1800–0100 hr. Traffic was carried on 705, ESB41, 5.320 MHz and 3.900 MHz. As the Daihatsu was set up a problem was found getting the generator to run for more than three minutes at a time. Ken (ZL4KD) made his way to Hagley and found a low oil problem which he rectified and stayed on to assist during the remainder of the evening.

At 1230 hr, relief operators Rob (ZL3RX) and Mark (ZL3BA) took over and operated through the night until they were relieved at approximately 0900 hr the next morning when Don, Ken and I returned.

Wednesday, 23 February

Operations continued at Hagley for the rest of the day. Most activity was centred on welfare requests between the Emergency Operations Centre (EOC) in the Art Gallery and the various welfare centres in the suburbs. Some communications issues were noted at Burnside High School, and we twice despatched Ken to assist and correct the set-up at this centre.

Steve continued his involvement with Civil Defence/USAR throughout the day. This continued through into April 2011 as work to open the CBD continues.

During the afternoon, Steve contacted us with a request for communications with a LandSAR team who were working in the Sumner Redcliffs area. Geoff (ZL3PX) and Ken (ZL4KD) attempted to get the AREC Civilian bus to the area but because of closed bridges, gridlocked traffic and damaged roads; they were only successful in arriving as the SAR operation in the area was closed off for the night. A trip that would normally have taken about 20min took over 2.5 hr.

As we were planning our next night shift rotation, we were advised that Hagley was to close, and by 1830 the last of the people had been transferred to other centres.

Thursday, 24 February

New tasking! AREC were tasked to provide communications for NZ LandSAR teams who will be conducting welfare checks through some of the more northern suburbs. Don and I took the Daihatsu and assembled with the LandSAR teams in Cranmer Square from where we were eventually sent to Brooklands.

On arrival at Brooklands we discovered that the local community had already been checked by the local Volunteer Fire Service. In addition, because of the impact of the September earthquake, the local community had already made their own door-to-door checks of most residences. Reporting this to the EOC, we were put on hold while another tasking was sorted out.

Next tasking arrived by radio from EOC Lyttelton and Governor's Bay. The SAR teams assembled into a long convoy and the AREC Daihatsu with appropriate orange flashing lights led the way through to the Lyttelton road tunnel. On arrival at Lyttelton, we deployed a SAR repeater on ESB-60 on a suitable knob and set up the Daihatsu in a local rugby field.

Once the teams were tasked and sent on their way, and our set-up was completed, the repeater coverage was checked using coverage prediction software. This gave a measure of confidence that the site would continue to be useful as the teams moved from Lyttelton through to Governors Bay.

This coverage prediction software was successfully used many times throughout our deployment for the planning and checking of repeater sites.

At the end of the day, a large number of houses had been checked and the more serious welfare needs sent through to the EOC. Our tasking was increased to include the remainder of the bays around the peninsular. Considerable preliminary planning was completed to get ready for the next days, including some initial thoughts to solving the very problematical radio coverage issues we would face. Following this, the SAR teams and AREC arranged to meet at Teddington the next morning ready to work through the remainder of Banks Peninsular and in particular the many small bays. The officer in charge (Incident Controller, IC) from the Council (for CD) went back into the EOC to explain what had been achieved and to confirm the expansion to our tasking for the next day.

Friday 25, February

New Rules! After the IC had returned to the EOC the previous evening, a decision had been reached to redeploy the LandSAR teams to Halswell Domain in what would later become Operation West.

All teams and AREC arrived

Christchurch AREC Comms Vehicles; temporary parking.

AREC at Bishopdale for Op Rubble.

Operations in Civilian at Halswell.

early, and the first teams were sent into Halswell and surrounding areas. An ESB-60 SAR repeater was initially installed above Halswell Quarry to provide coverage for the immediate area.

At the end of the day, the intelligence gathered was processed and summarised and then sent into EOC with the IC from CD who went back to explain in detail the outcomes achieved. A very large number of houses were covered in this first approach into the suburbs, and a great deal of valuable information gathered as to the conditions that residents were facing. A number of residents with serious medical or other needs were located; where these were life threatening a 111 call was placed for immediate assistance, otherwise an intelligence summary was compiled and sent through to the EOC for analysis that evening.

On the basis of the detailed reports gained from the SAR teams based at Halswell, CD expanded the brief to include all of the western suburbs, and later included Banks Peninsula. The SAR team numbers were increased and the Christchurch Management Support Unit (MSU) was called in to establish a computer network to manage the large amounts of data being received.

The ESB-60 repeater was relocated to Westmoreland, and then subsequently to Marleys Hill (with the 705 Amateur repeater) where it could be mains-powered. Extensive use was made of VHF simplex on ESX07 (and later MSX-27) for the SAR teams to communicate locally between themselves.

Operation West (a subsidiary of Operation Suburb) finally ran until the following Thursday evening (3 March). At its height, more than 350 LandSAR and 22 AREC personnel were deployed with up to 350 SAR members in the field.

Finally to cover the peninsula and the city suburbs, four SAR repeaters were deployed on ESB-58 (Lyttelton and Akaroa), ESB-59 (West Morland fill in) and ESB-60 at Marley's Hill. HF was used as a backup over Banks Peninsula for the 4WD drive teams (although the vertical incidence MUF was later determined to be less than 5 MHz), and we were able to borrow the DOC repeater on ES-157 at Mt Herbert.

AREC staff from Dunedin, Timaru, Christchurch, Blenheim, Wellington and Auckland all played a part (some being originally deployed as LandSAR members, and some directly as AREC members).

At the final count, over 800 man hours (AREC) were used, some 50 handheld radios were deployed to sector leaders along with the SAR team s own radios for individual team members.

18 sector leaders were responsible each having up to five teams of four people searching designated sectors and reporting back to SAR base. Total handhelds in the field about 150; we have never had so many handheld radios together for an operation of this magnitude.

During this time we were based at the Halswell Domain. We later added two forward teams, one at Akaroa and one at Lyttelton to provide VHF cover for the immediate search areas and to then send back consolidated reports to the main SAR base in Halswell Domain.

10-11 March

AREC were again requested to provide communications support for Operation Rubble based in Bishopdale. Operation Rubble required LandSAR teams to sweep though the suburbs identifying any rubble piles that were not clearly a result of cleaning up operations or from buildings that had been checked by USAR (with coloured certificates). The piles of rubble thus identified would be later checked by specialist teams from USAR. This operation lasted for two days, and used some 50 additional man-hours.

The aftermath

Steve Davis was still being used by Civil Defence as work to open the CBD continued. Although not strictly in an AREC role, when needed Steve had called on AREC to provide additional radio operator support. Ian (ZL3TAO) and Rob (ZL3RX) have contributed approximately a further four to five days assisting Civil Defence directly through this secondment.

Logistics

One of the greatest logistical problems has been finding sufficient handhelds and ensuring consistent frequencies sets. Over recent years the public safety and emergency service agencies in New Zealand have undergone a rapid transformation and standardisation of VHF communications with the establishment of a section of VHF spectrum in the 138–144 MHz to be designated as the ESB band (Emergency Services B band).

Frequencies have been allocated to all the primary emergency services eg New Zealand Police, the Ambulance Service, Fire, Civil Defence and Department of Conservation. New Zealand Land Search and Rescue (LandSAR) is granted permission by Police to use certain ESB channels for SAR operations.

The LandSAR VHF FM handhelds are equipped with two or more memory banks, each containing 16 memories. Bank 1 is standardised throughout New Zealand. Bank 2 can have channels which are suited to local area operational needs.

The newer Tait packs of radios (6) consists of a high impact carry case fitted with individual cradles for charging the batteries making this make a very convenient and efficient method of bulk handling of radios and safe transportation. The older Icom F3 handhelds use dry cells, although the newer Icom radios are also moving to rechargeable battery packs. Throughout New Zealand active LandSAR groups are allocated kits of radios and there are national pools of radios ready to be sent wherever required along with portable SAR repeaters and linking repeaters. Police also maintain kits of radios and repeaters for SAR.

There are a large number of things that we learned, and there is an on-going effort to capture these points. Many things went well but we have noted areas where it will be possible to improve further. Some things did not happen as expected, from these we hope to be able to distil some reasons why and some ideas of how to avoid the mistakes.

continued on page 32

Satellite feed and Civilian at Halswell (Op West).

SAR team briefing Halswell (350 SAR personnel).

There are certainly issues related to manning, national response, staff rotation, planning demands and many others that need to be considered, and the lessons available will take some time yet to be teased out and developed.

I wish to make my thanks known to many people for their assistance, guidance, support and direction throughout this event. To the Branch members of Branch 05 for their efforts over years to obtain and fit out the communications vehicles, without these the response from AREC would have been severely limited.

To the AREC members involved from all the Christchurch and Canterbury branches, irrespective of whether they operated this time or not. The choice of operators for any emergency of this nature will always be affected by who is available after helping immediate family, who is in the right place (location) and many other factors. For those that were not called on, or were not able to respond, it does not matter, your previous support in other events and in training and preparing the team all counts; without that we could not have responded at all.

To those AREC members from other branches, whether responding as part of LandSAR or directly as part of AREC; thank you. Your observations, provision of expertise and equipment are valued and needed. I hope that in turn Christchurch will be able to support you in like manner if ever required.

We also owe thanks to Police and DOC for getting radios delivered from around New Zealand and making access available to repeaters.

- To the National Director of AREC NZ; Jeff Sayer ZK6EA our special thanks
- Richard Smart ZL4FZ/ZK9EA
- Geoff Chapman ZL3PX/ ZK6EXA
- Section Leader, Christchurch AREC
- Assistant National Director AREC NZ

Activity Briefs
(A selection from March/April)

22/02/2011. Police / CD operation to identify rubble for subsequent checking by USAR Personnel. All of Christchurch checked for rubble.

1/03/11. Otago Branch 30. CD. Operation West "Christchurch Earthquake". Join Land SAR teams going door to door doing welfare checks after the Christchurch earthquake. Radios were provided to the teams from Dunedin on channel ESX 07.

2/03/11. Otago Branch 30 CD Akaroa, Operation West "Christchurch Earthquake". Assist Christchurch AREC by travelling to Akaroa and setting up a radio base to provide support to teams doing house-to-house welfare checks on Banks Peninsula. The Dunedin SAR portable repeater was set-up near the top of Long Bay Road. Base was set-up in the community hall at Akaroa. Channels ESB 58, ESX 07 and DOC channel 13 ESB 157 were monitored for any calls. HF 5680 was also set up and monitored.

3/03/11. Tararua District Branch 06. CD. Christchurch Earthquake. Advised by St John Ambulance being deployed to Christchurch, flying out Friday 4 March. Four days on ground, one days travel either side, working out of 21 Carlyle Street, Christchurch where alternative Ambulance SouthComm Communications Centre set-up. Accommodation at Waddington Camp, Old West Road, Christchurch.

10/03/11. Christchurch Branch 05. CD. Christchurch. Follow on operation from 6.3 magnitude earthquake.

12/03/11. Northland Branch 28. SAR. Pataua North, East of Whangarei. Search for missing fisherman, lost while trying to retrieve a net off beach in kayak at approx 04:00, before the tsunami in Japan arrived. Beach and river searched all day with no success but the body was washed up on beach next morning.

19/03/11. Nelson Branch 26. Sports & Training. Rainbow / Molesworth / St James Station Mountain bike event. 400 mountain bikers started the Rainbow Rage event this year, numbers greatly reduced previous years, no major accidents reported, just cuts, grazes and bruises. All radio communications were done HF and VHF. All went well.

2/04/11. North Canterbury Branch 68. Rural Fire Ashley Downs, North Canterbury. Fire in shelterbelt close to HT power transmission lines; within fire boundary of Ashley Forest. Fire extinguished. AREC provided comms for Forestry Fire unit.

10/04/11. Thames Branch 41. SAR. Thames Hospital area. Urban search for elderly patient who walked out of Thames Hospital. Found trying to hitch-hike to Waihi.

12/04/11. Eastern BOP Branch 51. SAR. Waioeka. Overdue hunter split from father and did not return as arranged. Teams in at 6.00 next morning to find the lost party in a creek bed making his way out.

21/04/11. Eastern BOP Branch 51. SAR. Galatea. A tramping party of three women on the third day of walk, set off their PLB. Heavy rain. SAR team of four with local to guide team around a waterfall, in at 22.00. Lost party found at 2.30 and walked out by 6.30. Had found waterfall impossible to pass.

22/04/11. Hastings-Havelock North Branch 13 SAR. Overdue runner in Ruahine Ranges. Listening watch commenced. One person at risk. Runner found at Triplex Hut area.

27/04/11. Thames Branch 41. SAR. Waiotahi Track behind Thames. Rescue 39yr old with badly sprained ankle and no torch from top of Waiotahi Track. Located and extracted on quad bike then transferred to Thames Hospital. Good comms on AREC EE band repeater on Hunua Range.

Conclusion

Thanks to those who have contributed to this issue. Material for the next one to please be in our hands by 3 July. Photos, if included, preferably on a separate CD (with captions) mailed directly to us. E-mail pix may be acceptable but will be at the Editor's discretion and must not be embedded in the text. Contact details: <zl3qr@nzart.org.nz> or <zl3ov@nzart.org.nz> or post to 6 Boyd Street, Rangiora 7400, or phone (03) 313 7137.

Reminder

The next Section Leaders Nets should be 20 June and 18 July, 3900 kHz USB at 1930 hr unless notified otherwise.

Until next issue,

73, *Geoff ZL3QR & Bev ZL3OV*

Contests

Contest Manager: Frank Hunt ZL2BR
<zl2br@ihug.co.nz>

2011 NZART Memorial Contest

When: 2 & 3 July 2011

Times: 2000–2300 NZST both evenings

Band: 80m

Modes: CW & Phone

Rules: The rules are the same as recent years and are in the NZART *Call-Book* on page 5-3 and also at <www.nzart.org.nz/contests>

Logs: Logs as email attachments are welcome in either text, Word or Excel format. Email them to <2bfrank@orcon.net.nz>. Paper logs should addressed to Contest Manager, 8 Manu Crescent, New Plymouth 4310. Closing date for logs will be 31 July 2011.

International HF Contest Calendar for July/August 2011

Contest	Dates	Times (UTC)	Website
DL DX RTTY	Jul 2/3	1100 Sat–1100 Sun	<www.drcg.de/>
IARU HF CW/SSB	Jul 9/10	1200 Sat–1200 Sun	<www.iaru.org/contest.html>
CQ WW VHF	Jul 16/17	1800 Sat–2100 Sun	<www.cqww-vhf.com>
RSGB IOTA CW/SSB	Jul 23/24	1200 Sat–1200 Sun	<www.rsgbcc.org/hf/rules/2011/riota.shtml>
WAE (Worked All Europe) CW	Aug 13/14	0000 Sat–2400 Sun	<www.darc.de/referate/dx/contest/waedc/en/rules/>
SARTG (Scandinavian) RTTY	Aug 20/22	0000–0800 Sat, 1600 -2400 Sat & 0800–1600 Sun	<www.sartg.com/contest/wwrules.htm>
SCC (Slovenian) RTTY	Aug 27/28	1200 Sat–1200 Sun	<lea.hamradio.si/~scc/rtty/htmlrules.htm>

From the VHF-UHF-SHF Contest Manager

Results of the Low Band Contest; 2nd and 3rd April 2011

(6 m, 2 m and 70 cm)

One log was received and is therefore declared the winner! Congratulation to Murray ZL1HI, on Great Barrier Island, for his fine solar-powered entry.

The band conditions were poor, with the ZL2 or ZL3 beacons not being detectable. The best DX on 6 m was 80 km to ZL1AVZ, and 351 km to ZL2IP on 2 m and 70 cm.

The full results can be found at: <www.vhf.org.nz>

Next Contests

The next contest is the ***Hibernation Contest,*** 50 MHz and up, on Saturday 11 and Sunday 12 June 2011, the weekend after NZART Conference.

The contest after that is the ***Brass Monkey Contest,*** 50 MHz and up, on Saturday 6 and Sunday 7 August 2011.

The operating times for both contests are: Saturday 1700 to 2300 NZST and Sunday 0700 to 1300 NZST.

All contest logs should be sent to arrive within two weeks, to <zl2wa@clear.net.nz> with Contest Log in the subject line.

Answers to crossword puzzle on page 29

Across (1) Anand, (4) protons, (8) vertical, (9) mat, (11) Smith chart, (14) very, (15) Iberia, (17) finish, (18) used, (19) central, (20) store, (23) ue, (24) shorts, (25) serial.

Down (2) November, (3) Dutch, (5) Ruataniwha, (6) ohm, (7) Satyanand, (10) attenuator, (12) thyristor, (13) criminals, (16) racks, (21) Rua, (22) eel.

Some may consider that the IARU HF World Championship, (what with it's important sounding title and all), to be the contesting showcase of the International Amateur Radio Union, but others including me, as I have stated often before, do not! However for casual contesters it's worth a few hours operating time. As usual I hope to find a few spare hours to operate in my own private contest category and will be doing my best to avoid working HQ stations!

Is anyone planning to operate in the CQ World-Wide VHF Contest? Pity this is not held in our mid-summer when 6m may produce the goods. Reading the rules for this contest would seem to indicate that any mode including FM is okay on 2m and 6m. There are award certificates for the winners in each category in each country! Now I realise that the ZL VHF and up DX-fraternity hold a few serious VHF-SHF contests each year, but the emphasis seems to be on "hill-top" operations with heaps of gear. But tagging-on to an international VHF contest where home stations with just a vertical antenna and a 2m FM transceiver "can have a go", may be worthwhile. Interestingly the results for the 2010 contest show that 45 HS (Thailand) stations sent their logs in; I bet a few of those won some nice certificates !

Interest and participation numbers are increasing for the IOTA Contest. I was surprised to learn that 2777 logs were received last year. Of those, 685 were from `island' stations. This is an excellent contest for casual contesters to spend some time in. The exchange is serial number plus your IOTA number for those of us who live on islands, which are OC036 North Island, OC134 South Island, OC201 North Island offshore islands and OC203 South Island offshore islands.

Coming Up

It is hoped to print the following articles in the next issue of *Break-In:*

- The Campbell Standard Mutual Inductometer
- Some further observations on the "Ground Gain" effect
- NZART Conference 2011 report.

More copy is needed urgently

Letters To The Editor

All Letters to the Editor must be signed and include the author's full name, call-sign, (if applicable) and address. Opinions expressed here are those of the author and do not necessarily reflect official NZART policy.

Letters to the Editor: guidelines to contributors

Letters to the Editor should be concerned with Amateur Radio and normally not exceed 400 words. Break-In *follow the guidelines given on page 4-3 of the 2002-2003* Call-book *"Standards of language, and topics best avoided". Accordingly sex, race, religion and politics are not acceptable subject matter.*

Sir

It is not often that amateur radio operators are getting praise but I like to pass some on to Jack ZL1AJ via this 'public' way.

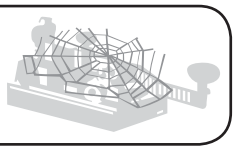
Jack is one of a kind in my thinking. He told me about his contesting days with several branches but the ones he seems to enjoy a lot are the later ones with Branch 40. Jack is an organiser who loves just setting up the system for those events to happen. He is getting the caravan(s), does the cuppa's and food and still enjoys doing the CW. I'm always gaining weight during the Jock White contest!

One challenge Jack has is getting his grandson Tom (ZL2TDM) to team up next year to continue with the winning concept! I could go on and on and on … but really all I want to say is: Thanks Jack! You are one of a kind.

73, *Bernard ZL1WT*

Silent Keys

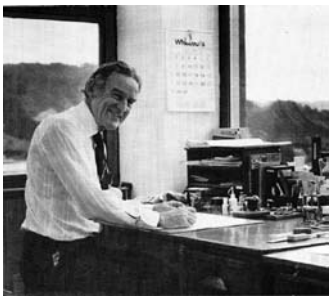
The Association deeply regrets to record the death of the following members and extends its sympathy to the bereaved.



Silent Keys: guidelines to contributors

Contributors are requested to limit their obituaries to between 200-400 words. Content should focus mainly on the amateur radio activities of the deceased. Normally photographs cannot be included.

Neville Copeland ZL2AKV, 1925 – 2011



Former NZART General Secretary and Honorary Life Member Neville Copeland ZL2AKV became a silent key last Friday night. Neville's health had been slowly failing in recent years and at the time of his passing he was a resident of a Rest Home in Stokes Valley near Wellington.

Neville was our Association General Secretary based in Astral Towers Upper Hutt from June 1982 through until June in 1998. He was our General Secretary for a record 16 year term. Neville was made an Honorary life member of our Association at Conference in 1998.

Neville was born in 1925 and all his working life prior to becoming our General Secretary had been spent with the New Zealand Post Office which he joined as a message boy.

During World War II he joined the RNZAF and graduated under the British Commonwealth Air Training Plan as a wireless operator.

After the war Neville rejoined the Post Office serving in a variety of positions including a time seconded to the DSIR as Postmaster at Scott Base, Antarctica. During this period he held the call ZL5AL and provided a DX bonanza for New Zealand and overseas amateurs. In 1975 he joined the Post Office's Radio Division from which he retired on 24 December 1981.

Neville was first licensed as a radio amateur in 1971 and joined NZART the same year. He attended radio classes at Upper Hutt Branch 63 and went on to play his part as the Secretary and the President of the Branch. He was made a Life member of Branch 63 in 1998.

As one who worked with Neville ZL2AKV both as chairman of the Headquarters Secretarial Committee and over my term as NZART President I will remember Neville for his dedication, his attention to detail, his loyalty and friendship.

NZART extends to Neville's wife Shirley and his family our deepest sympathy.

Jim Meachen ZL2BHF

Robert James ('Jim') Priest ZL2FS

Jim grew up in Inglewood, Taranaki where, as a boy, he developed a keen interest in radio. When he applied to join the RNZAF in 1940, as an airframe fitter, he was offered the position of Wireless Operator/Air Gunner because of his interest in radio, so he set about learning the Morse code with the help of the local Postmaster. Jim entered RNZAF service in 1941 undertaking elementary radio training at Wigram in course W20, before being posted to RAF Leuchars in Scotland. Later Jim moved to 14 Group, Tain, in northern Scotland, before being posted to the Mobile Air Reporting Unit at Croydon. In 1943 Jim was posted to Sicily and Italy, where he served until 1945.

On returning to New Zealand, Jim returned to his trade as a builder, met and married Elaine, his life long partner and soul mate. Jim was still keenly interested in radio, but not yet licensed when he joined Branch 27 New Plymouth. He became actively involved on the Branch Committee, being elected Vice-Chairman in 1953, and he held various positions including a term as Branch President. Jim took a keen part in Branch 27 activities, including search and rescues, usually for lost hunters in the back-blocks of Taranaki, and providing radio communication for car club rallies and amateur road races.

In the 1980's Jim assisted and ran the Triple "D" net that provided contact for Canadian yachts travelling the Pacific out of Vancouver, and in 1989 Jim and Elaine travelled to Canada and were hosted by Triple "D" members.

Jim was a respected CW and phone operator well known on the HF bands, who willingly assisted fellow amateurs. For many years, he was the QSL manager for New Plymouth, a position he held up until a few months ago. Jim had held the positions of equipment manager and Morse examiner for the local Branch, before being made a Honorary Life Member of Branch 27 on 2 June 2010.

Jim passed away peacefully in hospital on 8 March 2011 following a fall, and is survived by his wife, three children and their families.

Elaine XYL, Tarry ZL2KV, Bruce ZL3BN

Ted Gedye ZL2BSW

Ted was born in Wanganui and with his family moved to Palmerston North where he did his schooling and later his engineering apprenticeship. As a teenager he first encountered amateur radio hearing radio hams on his 'Hiker's One' receiver. Ted was employed at Steelfort Engineering in Palmerston North where two employees/radio hams, Doug Ross and Russ Lacey, were early mentors.

Amateur radio was put into the background for the next several years as Ted went to sea as a ship's engineer on vessels working the Tasman and New Zealand east coast shipping routes. After several years at sea he came ashore and joined the Wellington Harbour Board working on harbour tugs as well as in the engineering workshop.

He got interested in CB and then VHF radio and gained a 'T' call before breaking the CW barrier and getting his full licence. He maintained interest in both VHF and HF and was a long-time member of NZART Branch 50 and Branch 74 as well as supporting ZL6QH Quartz Hill activities.

Ted also did volunteer driving for the Royal New Zealand Foundation of the Blind and also used his engineering skills to repair mechanical Braille writing machines used by blind schoolchildren and blind members in the mid/late 1980's.

We will miss Ted from our Branch 50 meetings but more especially from the Sunday morning net where Ted had 'his' special place; he was usually 'Tailend Charlie'.

Our thoughts go out to his wife Marge and to his two sons and families.

73 de Branch 50.

Tony Fletcher ZL2ALJ

Cecil James Wornall ZL3QI

Jim was born on 23 June 1926, in Christchurch. Up to 1950 he looked after the shop and carried out appliance and radio repairs in an electrical contracting and wiring business in Amberley.

Jim was interested in film projection work, and assisted at the Town Hall. He applied for an adult apprenticeship with Rangiora Borough Council but the local Union, who had the power to approve apprenticeships, rejected the application. Jim arranged for the Council lawyer to oppose this in Court and Mr Justice Tindall, who was interested in electrical matters, ruled that there was no reason why Jim could not become an adult apprentice and work to become a registered electrician.

Jim then went to work for NAC workshops at Harewood, mainly on communications equipment. He transferred to the Physics Department at Canterbury University in 1958, becoming a technician under senior technician Paddy Pollard. He left Canterbury University to go to Christchurch Polytechnic in 1966, becoming Head of Electrotechnology Department in 1971. Many electricians and comms technicians will remember Jim's tuition at classes at Christchurch Polytechnic. He retired in December 1988, to continue PA work, and work on his bach at Tikao Bay.

In 1947, Jim became interested in outdoor public address work. He imported some Steanes metal horns from Australia, and provided sound for the Rangiora A&P Show from 1952 until 1958. He also provided

SPAM – Society For The Preservation Of Amplitude Modulation

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Nets:
3.850 MHz (AM) Friday nights at 2000 hr local time.

I received several messages of support for the folk in Christchurch from all around the world when they had their disastrous earthquake. These have been published on the NZART webpage but there was one specific to SPAM:

Greetings from the UK

This message was received by me just after the 22 February earthquake hit Christchurch:

Hello Roy,

From the members of Spam New Zealand in the UK – we send our best wishes to our fellow members in this time of sorrow. We hope things get back to normal quickly.

73/88 the UK lot

Silent Keys

There is one member to farewell this month. He is:

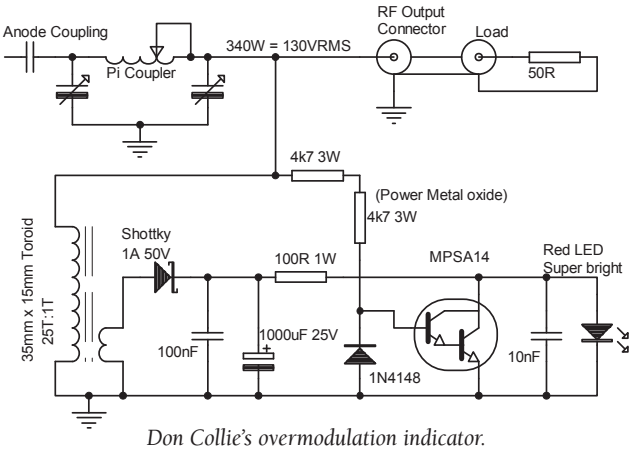
- 133, ZL2FS, Jim Priest, New Plymouth

Trans-Tasman AM Net

Last issue I mentioned that there was now an AM net running with some VK enthusiasts. It is on 7.125 MHz (AM) at 2100 hr local ZL time. This has now been changed to 7.120 MHz because of interference; and the time has been changed to 2000 hr local New Zealand time. There has been good activity with our brothers across the ditch.

A simple over-modulation indicator for AM transmitters

Here is a simple over-modulation indicator for AM transmitters in the 300W class. As the percentage modulation reaches 98%, a red super bright LED begins to glow, and if it reaches, or exceeds, 100% the LED glows brightly. This means that the operator knows when his transmitter is over-modulating, and possibly causing splatter, if the LED flashes as he speaks. The circuit is self powered, requires no setting up, and uses only eleven components, all of which are commonly available.



Don Collie's overmodulation indicator.

Referring to the circuit: The toroidal balun core is connected across the output connector of the transmitter, or externally across the coax transmission line feeding the antenna. If the SWR on the line is too high operation may be compromised. The one turn link winding, Schottky diode, and two capacitors provide a voltage to power the LED. An RF voltage across the 50 Ohm transmitter output causes a current to flow through the two 4k7 resistors, turning the Darlington transistor on every half cycle. The 1N4148 diode prevents this transistor being destroyed on the other half cycles. This transistor keeps the 0.01µF capacitor discharged so long as RF is present. If carrier cut-off occurs, which happens when 100% modulation is exceeded, the transistor is not switched on, the 0.01µF capacitor charges, and the LED turns on.

I have bench tested this design on 80m, 40m and 20m, but it should work OK on all the HF bands. It could be modified for lower power transmitters by connecting a tap on the toroid to the transmitter output connector, or across the line as before. There should be 100 to 150 V RMS at the hot end of the toroid for it to work properly. The design could be improved by putting a small fuse in series with the Shottky diode, as a large current can flow if downstream components should ever fail. I used two 4k7 resistors for safety, but a suitably rated 10k resistor would work if you feel brave. The circuit consumes about 2 W, which limits its usefulness with QRP transmitters. As the toroid winding is connected across the output of the Pi coupler, it acts as a safety choke should the anode coupling capacitor fail; a useful feature with my T1509.

Don B Collie Jnr
ZL4GX

Next Issue

In the next issue I plan to have news from the SPAM AGM which will be held at Silverstream on the Sunday of Queen's Birthday weekend.

Roy Symon, ZL2KH
Secretary / Treasurer
SPAM (NZ)

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sound for the Amberley Show from 1947, and the Oxford Show from 1952, until 2008. Amberley A&P gave Jim a bottle of whisky to mark his 50th Show.

As all who knew Jim will testify, Jim had a finely tuned technical brain covering electrical, electronics, radio communications, rally cars, sound, and teaching. Jim's ham life commenced in Amberley in 1952. Using the plentiful war surplus radio equipment then available, he was able to contact another amateur in Ashburton, on the 2 m band which was, was quite exceptional at that time.

Our condolences are extended to his family.

Ross Weir ZL3TFK

Reg Bott ZL3RE

Reg Bott ZL3RE passed away on 7 April, aged 86, after a short illness. Reg had a long and interesting life. Born in the Staffordshire potteries, he had various office-boy jobs in the district, but joined the Royal Volunteer Naval Reserve during the war, and had an interesting OE in Canada and USA training in the Fleet Air Arm. The war ended before he was sent into service and he took up teacher training. During the 1950's he and his young family emigrated to New Zealand, where he took up teaching posts in various outback locations in Northland and elsewhere. Eventually they moved to the South Island where he had several senior positions, including Head Teacher at Glenelg Health Camp and Cashmere Primary. Reg lived through the development of domestic radio, recalling his father's purchase of a crystal set, followed by various upgrades until they owned a superhet which picked up overseas stations and inspired Reg to become a DX listener and ultimately, an amateur operator.

Nigel Newman (for Br05)

WANTED: copy for *Break-In*

My stock of articles etc for future issues is running low so I appeal to members to assist with material for publication. This could be short or long articles on any topic related to amateur radio and electronics, constructional articles, book reviews, equipment reviews, software reviews, branch activity reports, etc.
I should also like to receive articles on electronics related topics such as auto-electronics, home sound systems, workshop practice; in fact anything that hams might find of interest. Thanks and 73, *John R L Walker ZL3IB (Editor)*
Email <zl2tw@nzart.org.nz>

DX Downunder

Graeme Hunt ZL1ANH and ZL1T
<graemeh@xtra.co.nz>

Conditions over the last few months have certainly improved with 15, 12 and 10m open to all parts of the world at various times of the day and night. A difference of a few hundred kilometres in ZL is interesting; often signals are audible in Auckland and not in Kerikeri or vice versa. There have been DXpeditions to Sao Tome, Andaman, Nepal, Bangladesh, Sierra Leone, Liberia, Angola and Central Kiribati. The two JA operators in Bhutan returned home early after the Sendai quake and tsunami. Many ZLer's CQs result in pile-ups from Europe, Asia or the USA and it is common for contacts to comment we are their first ZL and that they are often using simple wire antennas, low power or are mobile.

Some amateurs are combining DXpeditions with humanitarian work, places such as Haiti and many African countries are benefitting from this. The DXpedition still to take place to Spratley Island has a big medical facet. It works well for us DXers, we get to work the rare ones. It is usually possible – and encouraged – to make an additional charitable donation when QSLing.

Fading

The higher frequencies seem more susceptible to QSB or fading, and the following explanation by ZL3IX is worth sharing. There are two reasons for QSB:

1. The signal arrives via more than one path, with different arrival angles either in elevation or (for stations close to the Antipodes), in azimuth. As the path lengths vary relative to each other with time, the signals interfere constructively or destructively, causing the peaks and troughs.
2. Polarisation rotation. The polarisation of signals launched on an ionospheric path gets rotated as it propagates. The amount of rotation varies with time. When the polarisation of the arriving wave is the same as that of your antenna, you experience a peak, but when it is at 90 deg, you will experience a null.

There may be other higher order effects as well, but these two are the most important ones.

DX Modes

In previous columns I looked at antennas and transceivers. This month let's consider what modes you can use.

There are four main modes used by HF Dxers. There are a couple of things common to all QSOs with very rare DX. They will probably work split frequency, almost always listening above their TX frequency, and they always exchange a 59 or 599 (abbreviated on CW to 5NN) report. So should you, they aren't at all interested whether they really are strength 6 in Wellington – or your name, or even whether you live in Wellington. A trick for split operation is to listen to those calling the DX and net to the frequency of the one in QSO with the DX, or look for the DX operator's pattern, is he gradually listening higher or lower in successive QSOs?

SSB

While easiest to use, SSB uses more bandwidth than some other modes. For a similar power output, CW and particularly PSK31 are more effective. SSB frequencies to watch are around 1825, 3800, 14 195, 21 295 and 28 495 kHz. Remember the DX station may be listening on another frequency, usually higher. They will announce it like this: "VP8ORK listening UP" or "UP 5 to 10 (kHz)". In the last example he is Tx on 14 195, you should TX between 14 200-14 205. Occasionally DX will want calls by area (say Japan) or call-sign number (1 through 0). Respect this.

CW

ZL has some outstanding CW ops, I am not one of them, but have managed to work 180 countries on CW in the last five years using the following technique, even if the DX is rattling along at 30 wpm. Firstly, you aren't going to have a long

Figure 1. Mercy ship, currently at Sierra Leone.

conversation with a DXpedition, they want your call, and then your signal report (always sent as 5NN – it's shorter than 599). As in SSB, the station may be working split, They will send "VP8ORK UP1", so again set your TX 1 kHz above the DX frequency. Send your call-sign; if you are linked to a computer for your logging program it is simply a matter of pushing one of your F keys on the keyboard and the radio sends your call-sign. Your ability to recognise your own call is important, and sometime the DX only copies and sends part of it. When the DX sends your call, press another F key which is programmed to send 5NN.

Even if you don't use computer logging, some radios have a beacon or keyer function, just program the beacon/keyer with your call-sign and press the beacon/keyer button when you want to TX. If none of this works, learn to send just your call and 5NN. Sometimes the DX will limit calls to certain areas, OC (Oceania) and ZL are for us. EU, JA, AF, NA, AS and SA are not. DX CW frequencies are generally at the low end of the CW portion of the band. A very good learning program is Morserunner from <http://www.dxatlas.com/MorseRunner/>. This will get your speed up.

RTTY

Unless you are sitting by an old RTTY machine, your radio will need to be connected to a software logging program on your computer. I use N1MM, it is brilliant, comes with excellent help pages, is free and has MMTTY software included for RTTY. At first I had some trouble tuning to get anything sensible on the computer screen. A couple of things to help; use LSB and tune to about a 1000 Hz tone. See figure 2, this is what the screen will look like when the signal starts to decode. Note the two peaks on the top left screen, that's the mark and space. The right hand screen will make that cute cross thingy when the signal is tuned correctly; then watch the words scroll across your screen. Again, DX may be working split and may call for areas.

PSK31

This is a very effective mode, Sometimes the signal is barely audible but is written clearly on the screen. Again N1MM is great for this and includes MMVARI for digital modes. There is other good software including Digipan which reads up to 24 stations at once, and is also free. Once you have tuned your radio to the PSK part of the band (14 070 kHz on 20m), you won't need to change frequency as it will decode all signals in the passband. Use your computer mouse to click on the little ladders coming down your waterfall. Make sure you are on USB, turn off your RX audio if you wish, and make sure your TX speech processor is turned down too. This mode isn't used much for DXpeditions but it is surprising what comes through. Only low power is used, around 50 watts is plenty. I was calling CQ on 20m and was surprised to be called by a 3B8 and a FR5 on a very dead band.

Digital modes, particularly PSK31, are great if your hearing isn't as good as it might be. In fact you only need eyes not ears, and with the low signal levels possible, it's an ideal mode if you only have a small antenna and run low power.

I've been playing with JT65-HF, an intriguing mode for very low

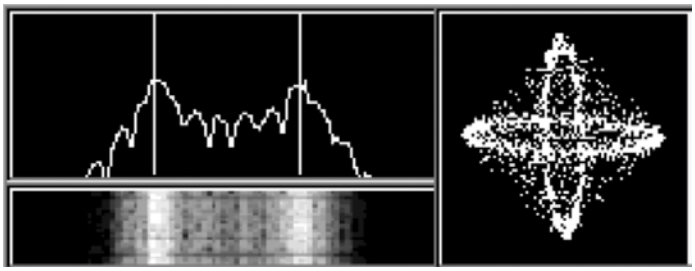

Figure 2. RTTY screen.

signal strengths, it transmits one minute, listens the next so the shortest QSO possible takes 6 minutes. Already I have some DX in the log at 10 watts.

Visit <www.jt65-hf.sourceforge.net/> for free software downloads and manual. This mode is not used by DXpeditions because of the slow rates.

Q codes

These were introduced in 1912 and as it's the centenary it's time they were updated. I have introduced several new ones:

QJB: *I already have thousands of JA QSL cards, send beer instead. In the same series:* **QJS** – *saki,* **QJG** – *geisha,* **QJT** – *Toyota.*

QHP: *If you continue to deliberately QRM me, I will send Harry Potter after you.*

Please send me any suggestions for new Q codes, and I'll include them in future DX Downunders!

DXpeditions

JX7VPA Jan Mayen Is: 4-16 July. One of the most sought after entities, follow progress at <www:janmayen2011.org>

Rotuma; should be active in June; calls may be either 3D2P, 3D20R, or 3D2A/R.

PP0T, Trinidade Island. Members of the Cantareira DX Group are in the planning stages of a DXpedition to Trindade Island (SA-010) sometime this year. Specific dates have not been mentioned, but the call-sign PP0T has been announced.

3D2CR Conway Reef is now planned to take place on 1-6 October.

R11FJ: Franz Josef land; till August.

P29CW: Papua New Guinea; till September.

ZD9GI: Gough Island; till September.

9Q6CC: Democratic Republic of the Congo; till November.

MJ & MU, Jersey and Guernsey. (Channel Island DXpedition). Jersey between 12-17 June and Guernsey between 17-21 June.

Southern Sudan; still looks like becoming a separate country in July this year.

From around ZL

Gary ZL2iFB is monitoring and recording audio clips of 10m beacons and publishing the info and MP3 clips on his beacon database at <www.HFbeacons.info>. Many DX beacons are extremely weak, and are in the sub-band (roughly 28.165 to 28.300 MHz) such as IW3FZQ/B 28.22711. That is one of an impressive set of at least nine homebrew beacons on different bands, all built and operated by Enrico, IW3FZQ (see <www.qsl.net/iw3fzq/Beacon-area.html> for information and photos). He sent Gary an excited email requesting a QSL card after seeing Gary spot his beacon on DXcluster.

Gary is trying to encourage both DXpeditioners and DXers to up their game through the DX Code of Conduct <www.DX-code.org> and with a set of "Hinson tips" at <www.g4ifb.com/html/dxing.html#PileupTips>. Additional tips are always welcome– just email him at <Gary@G4iFB.com>. (Abridged)

ANZA Net

Daily DX net at 0515z on 14 183 kHz and now also Saturdays 0445z on 21 205 kHz.

What's on the air now? <www.dxsummit.fi/DxSpots.aspx>

Announced operations: <www.ng3k.com/Misc/adxo.html>

QSL information: <www.qrz.com>

Sunspots: <www.solarcycle24.com/>

Acknowledgements

ZL3IX, OPDX, 425 DX News, ZL2iFB.

Contact me at *Call-Book* address or by email at <graemeh@xtra.co.nz>, and I am still needing your biography please!

QSL Bureau

by Barry Stewart ZL2RR
<zl2rr@xtra.co.nz>

Greetings to all readers. The Central QSL Bureau was closed whilst I was absent from home for two weeks in March revelling in some of the delights of the South Island, namely in the Leslie, Karamea and Wangapeka Track areas of the Kahurangi National Park. Nine weather-perfect days until returning to Nelson and a wet night.

After nearly two weeks away, I came home to around 1700 JA and 1200 SM QSL cards waiting to be sorted plus 400 for overseas bureaux from the locals. The large majority of the QSL cards, both inward and outward, are for CW contacts. If CW was dead, the bureau would need to be on life support to keep it functioning!

Recent postings include ZL1's Sub-bureau having 5kg parcels of QSL cards posted to it on 1 April and 2 and 4 May; ZL2 a 5kg parcel was posted on 15 April with the next one (as of 5 May) not yet quite making postal weight. Two envelopes, each of 700g of QSL Cards, were posted to each of the Managers of the ZL3 and ZL4 QSL Sub-bureaux in April and two each on 4 May. As one can deduce from the afore-going, the last week has been a busy one with 1220 cards arriving from W-Land, 1970 from JA, 716 from UR and 220 from HB plus several lesser amounts from various Bureaux

The following is page 1 of my Annual report on the operation of the NZART QSL Bureau for the year-ending 31 December 2010 to members. Whether it was declared 'surplus to requirements', edited out or what, I have no idea but I am sure a few members would have an interest in what the Bureau activities and its costings were during the past year.

Incoming mail

DX Packages/envelopes – 176. Cards – 33 218

ZL Packages/envelopes – 436. Cards – 23 956

Outgoing mail

DX Envelopes 431, (Cards 23 382)

ZL1 Bureau 40 kg of QSL Cards.

ZL2 Bureau 36 kg of QSL Cards.

ZL3 Bureau 13 kg of QSL Cards.

ZL4 Bureau 12 kg of QSL Cards.

ZL7T 4.5 kg of QSL Cards (Privately funded postage)

The NZART QSL Bureau's gross expenditure for this past financial year was $1539.97, an increase of $215.69 on the year ending 2009. The net cost to the Association was $1105.98 as against $900.98 for the previous year. Donations ($424.95) and non-member fees ($10.00) made up the balance of the running costs of the Bureau for the year under review.

The rest of the report can be read on p24 of the March/April 2011 edition of *Break-In.* On behalf of NZART, I thank those members who include a donation with their QSL cards from time to time. This assistance with helping to assist in reducing the Bureau's operating costs is most welcome.

If you have any questions, queries (QSL managers' addresses, etc) or comments please feel free to contact me either via mail (1 Caversham Road, Westmere, Wanganui 4501 or PO Box 857, Wanganui Mail Centre 4540), or email: <ZL2RR@xtra.co.nz>

73, *Barry ZL2RR*

MEMO to *Break-In* contributors

CDs:

Nowadays many contributors are sending me graphics and photos, etc on CD and this is much appreciated. At present the cost of a CD is less than the postage costs so, unless requested otherwise, they will not be returned. Please let me know asap if I still have a CD or photo that you would like returned and I will action. Thanks, *John ZL3IB Editor*

WARO – nz womens amateur radio operators

with Lynette McDonald ZL1LL
<lynette.mcdonald@xtra.co.nz>

By the time you read this column the 2011 NZART Conference will have been and gone. Those who attended will have had an enjoyable time. At this stage it looks like we would have a quorum at the WARO AGM so hope that this was so.

The nominations are in and most members of executive will be continuing in their positions. We will be welcoming Marlene ZL1MYL to the Executive. Marlene has been a WARO member for several years as an Associate until she obtained her call last year. The full list of the Executive will be published in the Winter Bulletin due out towards the end of June and in the July-August *Break-In*.

We wish friend of WARO Jim ZL2BHF all the best for his move to Nelson. No doubt he will meet up with WARO members Topsy ZL2LS and Sharon ZL2BQ!

Associate members

I would like to remind XYLs and partners who read this column that we would welcome you to join WARO as associate members. You do not need a call-sign and there is no requirement ever to get one. It enables you to keep up with those you meet at equipment sales and on the alternative programme at conference etc. An excellent publication called the *Bulletin* is prepared by Bev ZL1OS four times a year and which are full of interesting information.

Subscriptions

Subscriptions are now due and the Treasurer would appreciate receiving these as soon as possible. An account will be sent to you, mostly likely in the Winter *Break-In*.

If you do not wish to continue sponsoring a DX member please let Celia ZL1ALK know as soon as possible so the member can be reallocated. If you would like to sponsor an overseas YL please contact Celia. ALARA is getting lots of new members and some would like to be sponsored in to WARO and they would sponsor you into ALARA.

WARO 50th Anniversary

WARO was founded 50 years ago in March 1961. A luncheon is to be held at the Millenium Hotel in Rotorua on 10 March 2012. This is the site of where the original meeting was held. We have received information that several VK YLs hope to attend this luncheon. There will also be something held in Christchurch at the same time. Further details of price, time etc will be advised in due course.

Anniversary booklet

Joline ZL1UJB has offered to prepare a special booklet for the 50th Anniversary. She would like all WARO members, past and present, to prepare a profile about yourself and forward it to her for inclusion in the booklet. Members have many varied interests and occupations and it will be good to find out about these. Please let Joline have your profile at your early convenience so publication will not be left until the last minute.

Profiles are also required for the early members, many of whom are know silent keys. If you are able to prepare a profile for any of the silent keys please let Joline know.

A lot of members will have memories of former members and a paragraph about someone which brings back good memories to share would also be appreciated.

I know there have been some great stories of the conference alternative programme bus trips and at ALARAmeets etc which could be shared.

WARO group at Paaengaroa.
Back row: Ngaire ZL1KN, Margaret ZL1MB, Janet ZL1JAN, Maxine ZL1MGS, Biny ZL2AZY, Laureen ZL1BPT.
Front row: Maxine ZL1FW, Joline ZL1UJB, Celia ZL1ALK, Marlene ZL1MYL.

YL International 2012

Most of the organisation for this international meet to be held in Glenelg, Adelaide from 3-9 May 2012 is sorted out. The website <www.ylinternational2012.com> has lots of pages with details of events, prices, accommodation etc. There are accommodation options to suit most budgets. Trips include a wild life park, Hahndorf, dolphin river cruise, wineries progressive dinner, gala dinner etc. Glenelg is a tram ride from Adelaide and has a lovely beach. An extension of the meet is a trip on the Ghan to Alice Springs and then on to Adelaide for those who wish to do this. Some of the European YLs are intending to do this trip but their exchange rate is probably a lot better than ours! Quite a number of European and American YLs have indicated their intention to attend.

Tina VK5TMC would at least like an expression of interest (the form is on the website) to see how many are interested. A non-refundable deposit of A$50 is required when a registration form is completed but there is nothing to commit on the expression of interest form. Dates for payment are listed on the website.

This Meet is not restricted to YLs and quite a number of OMs attend. Also XYLs and their OMs are also welcome.

Break-In column

This is my last column as *Break-In* Columnist and I would like to thank John ZL3IB for his support during the last two years. I would also like to thank those who have made a contribution for me to use on this page. I have just been informed that Ngaire ZL2UJT, Topsy ZL2LS and Sharon ZL2BQ will be taking over the column from the next issue and I wish them well. Please continue to forward to them any photos etc that can be used in the column. Bev ZL1OS is always needing copy for the *Bulletin* and Rosemary ZL1RO needs information for the monthly official broadcasts.

33 *Lynette ZL1LL*

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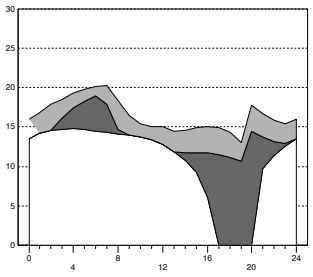
or attach a good quality scan of the card to <advertmanager@nzart.org.nz>

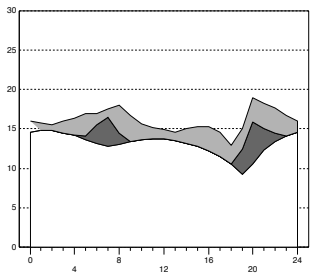
Price per each business card insertion for one issue is $41.50 + GST. The business card holder will be invoiced after publication. Your assistance is greatly appreciated!

Ionospheric Predictions

JULY / AUGUST 2011 **T-index = 63**



WN-
Moscow
(SP)
16548 km
312°



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London
(SP)
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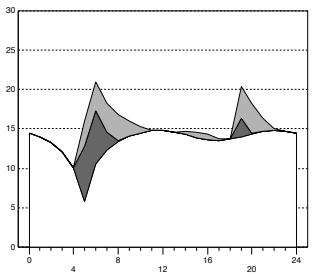
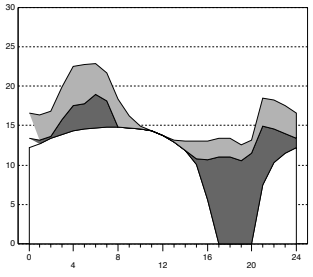
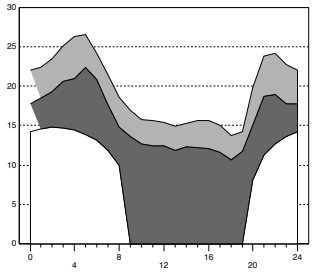
343°



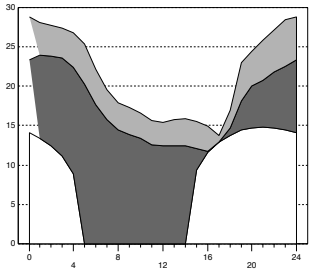
WN-
Jo'burg
(LP)
28265 km
31°



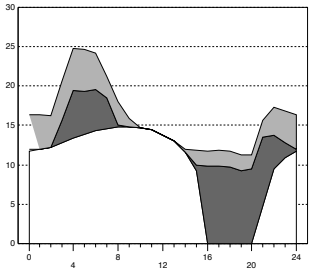
WN-
Istanbul
(SP)
17168 km
281°



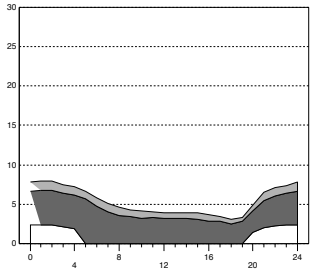
WN-
Tokyo
9274 km
332°



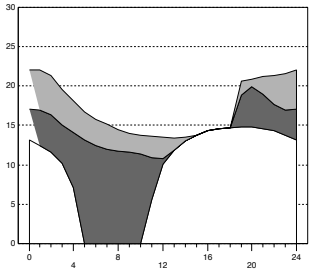
WN-
San
Francisco
10859 km
45°



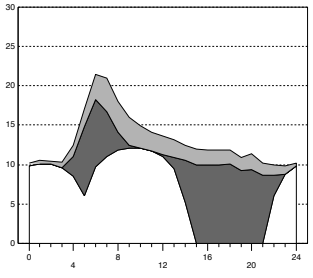
WN-
Cairo
16519 km
261°



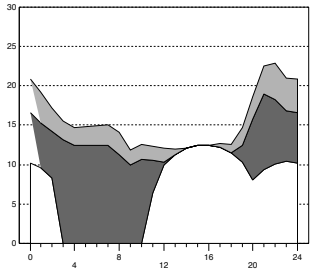
WN-
New
Zealand
300 km



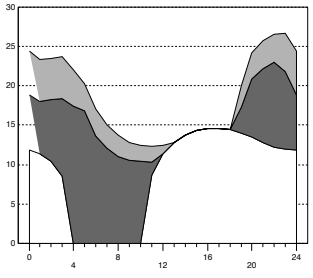
WN-
New
York
14402 km
66°



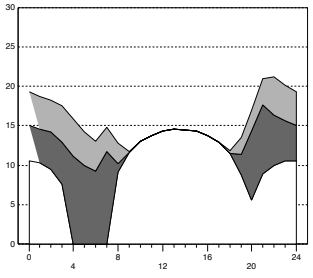
WN-
Jo'burg
(SP)
11759 km
211°



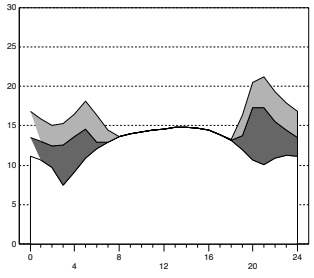
WN-
Rio de
Janeiro
11780 km
144°



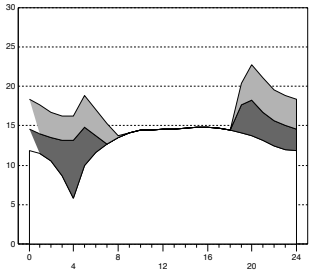
WN-
Barbados
13962 km
104°



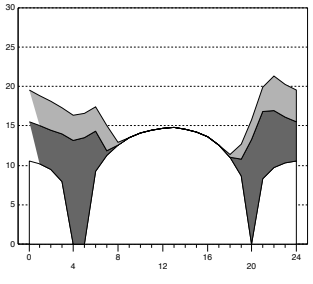
WN-
Dakar
16862 km
155°



WN-
Moscow
(LP)
23476 km
132°



WN-
Istanbul
(LP)
22856 km
101°



WN-
London
(LP)
21210 km
163°

Horizontal axis shows time in UTC.

Vertical axis shows frequency.

Propagation is possible in the shaded areas, with best operation in the darker area.

These predictions are based on solar activity data supplied by IPS Radio and Space Services.

See pages 6–9, Break-In May/June 2004 "Choosing the Best Frequency" by the late John Gabites ZL2AQ for interpretation of forecasts and explanation of terms MUF, OWF and ALF.

HAMADS

WANTED: RADIO VALVES. Cash paid for old radio and TV valves. Prefer new in boxes. Ph (09) 575-6940 or E-mail <paul.ssegrub01@gmail.com>.

WANTED: X54-1540-00 Counter Unit Digital Display for TS-530S or TS-530S for parts. Contact ZL2ACJ. E-mail <zl2acj@paradise.net.nz>.

WANTED: Valves wanted to purchase, fair price paid, all types but esp following types ECC32 ECC33 ECC34 ECC35 B65 6SN7 6SL7 ECC81 ECC82 ECC83 ECC803S ECC88 E88CC E188CC 7308 EF86 KT61 KT66 KT88 EL34 EL37 PX4 PX25 GZ32 GZ33 GZ34 GZ37 CV378 CV575 VT52 45 50 211 801 805 845. Also looking for an AVO or Weston Valve Tester and a good quality capacitor tester. Geoff Edwards, Valve Radio Spares, 12 Oxford St, Lyttelton 8082. Ph (03) 328-9208 or (027) 433-8452 or Fax (03) 328-9207 or E-mail <tubehead@xtra.co.nz>.

WANTED: RACAL RA-17 or similar model HF receiver. Any condition (preferably needing repair). Contact Don Collie Jnr ZL4GX, 6 Burns Street, INVERCARGILL, Ph (03) 216-5740 or (027) 330-4570 or E-mail <nccollie@vodafone.co.nz>.

WANTED: 75 Ohm Hardline: Any lengths 100m or longer, .500 or .540, sought for propagation tests. Will pay any reasonable costs. E-mail ZL4AAA at <skyking@clear.net.nz>.

FOR SALE: Kenwood TS120S, manual, leads, hand mike and mobile mount, ex estate of ZL2AQI–$300. ZL2AFT. Ph (06) 358-8403 evenings or E-mail <zl2aft@xtra.co.nz> or *Call-Book* address.

FOR SALE: Icom IC-718 HF Transceiver. 3 weeks old, "NZ New" including DSP and other extras totalling over $1200. 2 years Icom NZ warranty–$895 + carriage. ZL4AX. Ph (021) 158-2521 or E-mail <zl4ax@yahoo.co.nz>.

FOR SALE: Yaesu FT-60R VHF/UHF HT in original box c/w manual and charger plus extras – ADMS-1J programming software with 9 pin serial cable and adapter, E-DC-5B car cigarette lighter battery charger, CT-44 Mic adapter – $400 the lot including delivery in NZ. ZL3LSD. Ph (03) 358-9100 or E-mail <lorne.douglas@gmail.com> or *Call-Book* address.

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Com-Centre and *Break-In*

It is with regret we have to advise that Com-Centre Communication Ltd have decided to withdraw from advertising in *Break-In.* Richard Rowntree ZL1BOK of Com-Centre has supported *Break-In* with advertising, and NZART with donations of equipment for prizes for over 20 years for which we are most grateful.

The *Break-In* team wish him well and hope he may be enticed to return to advertising in *Break-In* the future.

John Walker ZL3IB, Editor
Lorne Douglas ZL2AHB, Advertising Manager

Hamads and Classified Advertising in *Break-In*

Hamads up to 30 words are now free as a service to members but the following conditions will apply:

(1) Hamads. A single, free Hamad in each issue of *Break-In* is only available to financial members and Branches of NZART buying or selling personal equipment. Members and Branches wishing to use this service must include their NZART Membership Number or other evidence of membership. If possible they should use the official HAMAD form (on the reverse of their address sheet). If this is not convenient the advert may be emailed or sent typed double-spaced, but proof of current membership must be provided.

Each free Hamad is limited to 30 words; any extra words will be charged at the current rate of 25c per word, telephone and fax numbers count as two words each, e-mail addresses and *Call Book* address as three words each. All prices include GST. Free Hamads will also be accepted for sales of deceased estates where the member was a financial member of NZART during the past 12 months and from branches who are financial members of NZART (ie have a Membership No).

Advertisements are accepted in good faith from amateurs and may only be used be the sale of used radio and allied equipment. The Association, or its representatives, can take no responsibility for them nor take part in any discussion resulting from sales or purchases; remember "Caveat emptor". In case of dispute, the Editor's decision is final.

Trade or business adverts, even from members, will not be accepted here, since this is a subsidised service to members.

(2) Classified Advertisements are available to members, non-members and commercial firms offering products or services for sale, etc. All adverts not meeting the Hamad criteria will be considered to be Classified Advertisements.

Classified Advertisements will be charged at 40c per word. Bold type is available at 50c per word. For semi-display (ie rule above and below) add $5.00. All Classified Advertisements must be pre-paid, receipts will not be given. All prices include GST.

(3) Display style adverts will be still be charged for at the current rates.

(4) Closing date. Please send Hamads and Classified Advertisements to The Advertising Manager, PO Box 1733, Christchurch, to be received no later than the 10th of the month prior to publication. Please make cheques payable to NZART; no cash or credit cards. The Editor and NZART Inc reserve the right to discontinue or decline any advertisement.

For further information and commercial advertising rates, please contact:
Lorne Douglas ZL2AHB, Advertising Manager, c/- PO Box 1733, Christchurch. Telephone (03) 358-9100. E-mail: <hamads@nzart.org.nz>.

EastFest

Saturday and Sunday
10-11 September 2011

Venue: Ashburton Senior Centre, 206 Cameron Street, Ashburton

Following on from the hugely successful WestFest, held in Murchison last year, we have decided to hold a similar event in Canterbury this year. The format will be similar to WestFest, eg many talks and demonstrations of "hands-on" ham radio.

We will provide morning and afternoon refreshments but not lunch or evening meals. Further details to follow closer to the event.

No registrations, just let either Jim Nelson ZL3ND <Jim.Nelson@xtra.co.nz> or Tony Buckland ZL3HAM <buckland@scorch.co.nz> know you're coming so we have an idea of numbers. Cost for the weekend will be around $5.

RadioTek May 2011

A student engrossed in his project.

Second timers make speaker amplifier project.

RadioTek works stations with full tool kit.

Br05 President, David ZL2IC and son Mathew ZL3TOBE.

Grandfather, Ron ZL3RON helps Grandson.

RadioTek is open to all age groups for having fun.

New High Power Amplifier

Modules for 1.3 GHz!

The brand new power amplifiers MKU PA 131000 CU and MKU PA 13250 CU provide excellent efficiency together with brilliant linearity and are ideally suited for huge EME- and contest-operations. The used LDMOS technology represents the current state of the art and allows the development of compact amplifier modules with high output power.

Type	MKU PA 13250 CU	MKU PA 131000 CU
Frequency range	1270 … 1300 MHz	1280 … 1300 MHz
Input power	4 … 6 W	20 W … 30 W
Output power	250 W	1000 W
Efficiency	typ. 50 %	typ. 50 %
Supply voltage	+ 50 V	+ 50 V
Current consumption	max. 12 A	max. 40 A
Input connector / impedance	SMA-female, 50 ohms	SMA-female, 50 ohms
Output connector / impedance	N-female, 50 ohms	7/16-female, 50 ohms
Case	milled copper, silver-plated	milled copper, silver-/nickel-plated

Applications

- Analog and digital operation modes e. g. SSB, CW, WSJT, (D)ATV
- High-Power EME-operations

Features

- High linearity
- High efficiency (up to 50 %)
- 50 V LDMOS technology
- Built-in sequence controller and overheat protection (only MKU PA 131000 CU)
- Milled copper case for optimum heat transfer

KUHNE electronic
MICROWAVE COMPONENTS

For further information please visit our website www.db6nt.com

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